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# **DEVELOPING THE FOOD GUIDANCE SYSTEM FOR "BETTER EATING FOR BETTER HEALTH," A NUTRITION COURSE FOR ADULTS**

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## SUMMARY

"Better Eating for Better Health"<sup>1</sup> is a nutrition course for adults developed cooperatively by the U.S. Department of Agriculture's (USDA) Human Nutrition Information Service (HNIS) and the American National Red Cross. This report describes the technical development of the food guidance system presented in the course and illustrates some ways the system may be used in planning diets.

The purpose of the nutrition course is to enable the consumer to make wise personal food decisions based on current concepts of nutrition for health promotion and maintenance. These concepts are based primarily on the dietary guidelines published by the Departments of Agriculture and Health and Human Services, emphasizing both selection of a variety of foods to obtain needed nutrients and moderation of fat, cholesterol, added sweeteners, sodium, and alcohol.

A major component of the course is the food guidance system, which organizes information about food and nutrition so that it can be applied to making food selections that promote health. The framework for this system is groups of foods commonly available in the United States, categorized by the nutrients (protein, vitamins, and minerals) they contain. This framework (illustrated in the course by the Food Wheel, Appendix I) provides a context for the organization and presentation of other nutrition information in the course, including additional information on fat, cholesterol, sodium, and sweeteners in foods, and ways to moderate these in the diet. Because it is a system with multiple components that are presented in a sequential manner throughout the course, its various parts should not be used alone.

As a first step in the development of the food guidance system, goals were established based on current nutrition research and recommendations of expert scientific groups. The goals in turn served as a basis for developing the objectives used

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<sup>1</sup>"Better Eating for Better Health" is published by the American Red Cross. Course materials consist of an Instructor's Guide and a Participant's Packet, which includes a Participant's Guide, six booklets on nutrition concerns at different stages of the life cycle, and a poster of the Food Wheel. Training of instructors and delivery of the course are carried out under the auspices of community Red Cross chapters nationwide. Persons interested in teaching or participating in the course should contact their local Red Cross chapter. Copies of course materials are not available from USDA.



to evaluate the system. These objectives specified a range of food energy levels, nutrient levels, moderate levels of fat, cholesterol, sweeteners, and sodium, and adequate levels of complex carbohydrates. Additional objectives were developed for the usability of the system.

The framework for the system is a core of major groups of nutrient-bearing foods with suggested ranges of servings from each group. Unlike other current food guides, the recommendations are for the total diet rather than for a foundation diet. In developing this framework, food sources of calcium, iron, magnesium, zinc, vitamins A and B<sub>6</sub>, and folacin were given particular attention, because these nutrients are below recommended levels in diets of many Americans. Examples of diets using this framework of suggested servings from the major food groups and sub-groups were defined to meet a range of energy levels. Ability of these examples to meet nutrient objectives was evaluated using food composites for each food group and subgroup. These composites were based on typical selections of foods in each group as reported by individuals in the 1977-78 Nationwide Food Consumption Survey. For the purposes of this evaluation, foods in the composites were generally considered to be in their leanest forms, such as nonfat milk, meats trimmed of all fat, poultry without skin, and fruits and vegetables without added fat(s) or sweetener(s).

Eating the fewest servings from the major food groups suggested in the guidance framework generally provides RDA levels of nutrients for most sex-age groups. The exceptions are zinc and folacin for teenagers and adults, and iron for toddlers, teenagers, and women of childbearing age. However, the system provides these nutrients at levels higher than those usually consumed by these individuals. Moreover, as additional servings of fruits, vegetables, and grains and an additional ounce or two of meat, fish, or poultry are added, levels of iron, zinc, and folacin approach or meet RDA levels.

The amount of food energy provided by the recommendations of this guidance system depends on the number of servings selected from each food group and the specific type of foods selected. Of special importance for determining the food energy level--as well as for meeting objectives for moderation of certain food constituents--are the amounts of fat and sweeteners in the foods selected or added to foods. However, the additional fat and sweeteners are not expected to substantially affect protein, vitamin, and mineral content of the diet. Effects of additional fat and sweeteners on food energy and levels of fat, cholesterol, sodium, and sweeteners were evaluated by adding increasing amounts of fat and sweeteners to the example diets evaluated for nutrient content earlier using the lean composites from each food group and subgroup.

Thirty-five percent or less of calories from fat and 12 percent or less of calories from sweeteners represent levels considered moderate by many expert scientific groups. When fat and sweeteners are consumed at these levels, the food energy of diets selected as suggested by the food guidance system ranges from 1400 to 3200 calories. This covers most of the ranges of food energy for various sex-age groups recommended by the Committee on Dietary Allowances. Sodium in the examples falls within the safe and adequate range for adults (1100 to 3300 mg). Except at the highest food energy levels, cholesterol was 350 mg or less.

In "Better Eating for Better Health," the food guidance system provides important supplementary information that is not reproduced in this report. Tables and text present information on food sources of fat, cholesterol, sodium, and sweeteners, and suggestions for ways to reduce their use in food preparation and at the table. "Trade-offs" are used to illustrate the approximate amounts of fat and sweeteners in a number of common foods. Course participants are encouraged to use this information in the context of the framework of the system by choosing foods from the food groups needed to obtain adequate nutrients and by balancing their food choices to moderate their overall intake of fat, cholesterol, sweeteners, and sodium.

To more specifically illustrate possible application of the food guidance system, ten menus were developed for this report. Levels of protein, vitamins, minerals, total fat, cholesterol, sodium, and sweeteners in the menus were tabulated. The purpose of these menus was to illustrate flexibility in selecting a wide variety of foods within each food group and in selecting specific food sources of fat and added sweeteners. They also illustrate the principle of balancing those food choices that are higher in fat, sweeteners, or sodium with those that are lower to achieve overall moderation of these food constituents. Finally, one of these menus was adapted for several individuals differing by sex, age, and physical activity to demonstrate the flexibility of the system in accommodating their various energy and nutrient needs.



# **DEVELOPING THE FOOD GUIDANCE SYSTEM FOR "BETTER EATING FOR BETTER HEALTH," A NUTRITION COURSE FOR ADULTS<sup>1</sup>**

## **INTRODUCTION**

The evolution of food guidance corresponds to the growth in understanding of nutrient composition of foods, human nutrient needs, and the relationship of diet to health (1). In the first half of this century, food guidance for healthy Americans emphasized balancing protective foods with foods that primarily contribute calories. A number of different food guides and food plans published during that time reflected this concept (2-13).

In 1958, the U.S. Department of Agriculture (USDA) published "Food for Fitness--A Daily Food Guide" (14), popularly referred to as the "Basic Four," which highlighted consumption of protective or nutrient-dense foods. The "Basic Four," with only minor modifications, was a focal point of nutrition information for the next two decades (1). In 1979, USDA's publication, "Food" (15), introduced the Hassle-Free Guide to a Better Diet. This guide expands the "Basic Four" to include a fifth group called Fats, Sweets, and Alcohol. This group highlights foods and food ingredients that are targeted for moderation. Like the "Basic Four," the Hassle-Free Guide suggests amounts of foods to provide a foundation for a good diet.

In 1980, the Departments of Agriculture and Health and Human Services jointly published "Nutrition and Your Health...Dietary Guidelines for Americans" (16). Its seven guidelines emphasized the need for consuming a variety of foods to provide essential nutrients while maintaining recommended body weight and moderating the amounts of nutrients and food constituents that may be risk factors in certain chronic diseases. "Ideas for Better Eating" (17), a USDA publication, illustrated how menus could be planned to implement the Dietary Guidelines. This menu planning strategy evolved into the food guidance system developed by HNIS for the American Red Cross course, "Better Eating for Better Health." It differs from most other current guides in that it suggests foods for an entire diet.

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A food guidance system organizes information about food and nutrition so that it can be applied to making food selections that promote health. In the food guidance system developed for "Better Eating for Better Health," a framework for selecting a variety of foods which is illustrated by the Food Wheel provides the central core around which other nutrition information is organized (Appendix I). This framework organizes foods commonly available in the United States by grouping them by the nutrients (protein, vitamins, and minerals) they contain, and suggests a way these foods can be combined to provide the nutrients needed for good health. A companion piece to the Food Wheel, A Day's Worth of Food and Nutrients, includes more detailed information about the food groups, their nutrient contributions, and amounts of foods that are counted as servings (Appendix I). It also includes "trade-offs" that illustrate approximate amounts of fat and added sweeteners in some popular foods. The Food Wheel and A Day's Worth of Food and Nutrients are supplemented by tables, activities, and text which provide additional information about sodium, sweeteners, total fat, fatty acids, and cholesterol content of foods as well as suggestions on how to moderate consumption of these nutrients and food constituents. All of this information comprises the food guidance system designed for "Better Eating for Better Health."

This food guidance system has been field tested and found to be effective in helping course participants to learn and apply the nutrition concepts of variety, moderation, and balance to their own diets (18, 19). Other food guidance systems suggesting different food groupings and selection patterns may be more appropriate for some groups such as vegetarians, ethnic groups with distinctly different food preferences, and individuals on medically prescribed diets.

The purpose of this report is to describe in detail the development of the food guidance system presented in "Better Eating for Better Health" and to illustrate some ways it may be used in planning diets.

## **GOALS AND OBJECTIVES FOR THE FOOD GUIDANCE SYSTEM**

In order to develop this food guidance system, nutritional goals, based on the Recommended Dietary Allowances (RDA) (20) and the Dietary Guidelines (16), and goals for the use of the system were established. The goals were expressed as a series of specific objectives against which the system could be evaluated.



The goals and objectives for this food guidance system are summarized in Table 1.

In establishing specific objectives for this system, data on the diets and food selection of individuals and households from national surveys since 1970 were reviewed. The surveys reviewed included the 1977-78 Nationwide Food Consumption Survey (NFCS) and the first and second National Health and Nutrition Examination Surveys (NHANES I, NHANES II). The Lipid Research Clinics (LRC) Prevalence Study (1972 to 1976) was used to supplement information from national surveys on the amounts and types of fat and carbohydrates in diets and measures of food energy, cholesterol, and alcohol intake. These surveys are described elsewhere (21-24). Unless otherwise noted, data from the NFCS are for a 3-day period; data from NHANES I and II and the LRC study are from 24-hour recalls. Food composition data are used to calculate the nutrient and food energy content of diets reported in surveys and of food suggested in the guidance system.

Information on the nutritional quality of U.S. diets, as indicated by surveys, and on the nutrient composition of the U.S. food supply has some limitations (25). Although care is taken in collecting and processing survey information, reported food intakes may not always be valid and reliable measures of what was actually eaten. For example, some individuals may not have been able to accurately determine the kinds and amounts of foods they ate, or their reporting may have been biased toward a diet they believed to be more appropriate than what their own diets actually were (26). The quality of food composition data for a few nutrients and food constituents is subject to question due to a lack of acceptable standardized methodology (27, 28). Furthermore, food composition data are not available for some of the thousands of foods Americans eat. The possibilities of imprecise measures of nutrient consumption and food composition data were considered in establishing objectives and evaluating this food guidance system.

The recommendations on desirable nutrient intakes by the Committee on Dietary Allowances of the National Academy of Sciences (20), as well as recommendations based on current understanding of the relationship of diet to chronic diseases as presented in the Dietary Guidelines (16), were used to develop specific objectives for this food guidance system. Both the RDA (20) and the Dietary Guidelines (16) were established recognizing that additional research is still needed to improve estimations of nutritional requirements and to show connections between diet and certain chronic diseases. Thus, as new information is developed, the objectives of this food guidance system and the system itself may need to be modified to reflect the new

findings. The system goals and the rationale for each objective are presented on the following pages.

#### Food Energy

Goal: To assist individuals in selecting diets that have an appropriate amount of food energy to maintain "ideal" weight.

Both the Dietary Guidelines (16) and the RDA (20) recognize obesity as a problem for some people in the United States. Obesity is associated with high blood pressure, increased levels of blood triglycerides and cholesterol, and non-insulin-dependent diabetes (16). All of these are associated with increased risk of heart attacks and strokes. Thus, the guidelines stress the importance of maintaining "ideal" weight and, if overweight, gradually reducing to achieve "ideal" weight. The Committee on Dietary Allowances (20) suggests that individuals who are already obese should reduce energy intake below their suggested range as one measure in a weight reduction program. However, they caution that diets must allow enough energy for efficient utilization of protein and for the inclusion of foods that are sources of essential nutrients. Increased physical activity is also suggested as an important part of a weight reduction program.

The Committee on Dietary Allowances (20) has established ranges of recommended energy intake for the U.S. population. These ranges are relatively broad for most sex-age categories (Figure 1). If viewed across all sex-age categories, they range from 900 calories for 1 to 3 year olds to 3900 calories for males 15 to 18 years of age. However, for most sex-age groups, the recommended food energy range falls between 1400 and 3200 calories (Figure 1).

Mean energy intakes for many sex-age groups from NHANES II (29) and the 1977-78 NFCS (30) are low compared with recommendations. Women in particular reported low food energy intakes. For women 23 to 50 years of age the recommended energy intake is 1600 to 2400 calories, yet according to the 1977-78 NFCS (30), mean food energy intakes were around 1500 to 1600 calories. These surveys also indicate that a significant number of women had food energy intakes below 1600 calories. Over 40 percent of the women between 23 and 50 years of age surveyed for 1977-78 NFCS reported an average daily food energy intake of 1400 calories or less for a 3-day period. Data from NHANES II were similar (29). These data indicate that either a significant number of women are consuming fewer calories than recommended or that they are under-reporting food intake. The LRC Prevalence Study (31), a more limited sample, reported an average food energy intake of around 1940 calories for women 20 to 49 years.



In this study, 25 percent of the women between 20 and 49 years reported intakes around 1500 calories per day or less.

The concern with the relatively low food energy intakes reported by many women is the concomitant low intake of many essential nutrients. Even at 2000 calories, the midpoint of the RDA food energy range for women 23 to 50, it has been demonstrated that major modifications in average consumption patterns are needed to meet current RDA levels (32). As calories are reduced further, it becomes even more difficult. The calorie range covered by this food guidance system, based on food energy recommendations of the Committee on Dietary Allowances (20), is broad--a range of 1400 to 3200 calories. Even so, it was recognized that this range would not include desirable intakes for all persons, and that special provisions would have to be made to meet the lower food energy needs of young children and the higher food energy needs of some teenage boys and very active men. The objective of this food guidance system for food energy was to develop a framework for selecting diets that span the recommended food energy ranges for most of the U.S. population--1400 to 3200 calories.

Protein, Vitamins,  
and Minerals

Goal: To assist individuals in selecting diets that meet the RDA for all nutrients without depending on contributions of supplements or of a few foods fortified with large amounts of one or more nutrients.

In adopting the RDA as nutrient goals for this food guidance system and in evaluating the system in terms of meeting objectives based on these goals, the RDA themselves must be understood. The RDA are established to exceed the requirements of most healthy individuals to assure that the needs of nearly all in the population are met (20). Since the requirements of any particular individual using a food guidance system are not known, it is an appropriate goal for this guidance system to try to provide all nutrients at allowance levels. However, it is important to recognize that a diet that fails to meet the RDA is not necessarily inadequate for individuals selecting that diet.

It is also important to recognize that RDA have not been established for all nutrients known to be needed by man. The Committee on Dietary Allowances states, "RDA are intended to be met by a diet of a wide variety of foods rather than by supplementation or by extensive fortification of single foods" (20). Also, if a food guidance system depends on the use of supplements or a few highly fortified foods, it will not assure nutritious diets for individuals who do not regularly select them. Thus, this guidance system does not depend on these items to meet nutritional objectives. The usefulness of supplements or a few highly fortified foods in improving nutrient levels of certain diets is discussed in the course.



Data from the 1977-78 NFCS (33) indicate that diets of a majority of individuals meet allowance levels for a number of nutrients--protein, thiamin, riboflavin, niacin, vitamin B<sub>12</sub>, vitamin C, and phosphorus. Thus, the first nutrient adequacy objective for this food guidance system is to assure that diets continue to meet the RDA for nutrients that are generally adequate in U.S. diets.

Several nutrients were identified as "problem nutrients" in the 1977-78 NFCS. "Problem nutrients" are defined as those nutrients for which 30 percent or more of individuals had 3-day intakes falling below 70 percent of the RDA (33). Using this arbitrary criterion, calcium, iron, magnesium, and vitamins A and B<sub>6</sub> were identified as problem nutrients.

RDA have been established for some nutrients for which the nutrient composition values for many foods are not known. Consequently, intakes of zinc, iodine, folacin, and vitamins D and E have not been reported in food consumption surveys. Estimates for vitamin E (32, 34) and for iodine (35) in diets indicate that U.S. diets generally meet or exceed allowance levels. It is assumed that the requirement for vitamin D for most healthy people will be met by adequate exposure to sunlight. Estimates of levels of zinc and folacin were calculated based on limited nutrient data for average food patterns derived from the 1977-78 NFCS (32, 34). These estimates and estimates of the amounts of zinc (36) and folacin (Note 1) available in the food supply suggest that the amounts of folacin and zinc present in U.S. diets are less than allowance levels for adults. Thus, zinc and folacin are considered "problem nutrients" along with calcium, iron, magnesium, and vitamins A and B<sub>6</sub>.

The second nutrient adequacy objective is to give particular emphasis to selection of foods that are sources of "problem nutrients"--calcium, iron, magnesium, zinc, vitamins A and B<sub>6</sub>, and folacin. Since the degree of dietary change necessary to meet allowances for these nutrients at an appropriate food energy level varies with the particular problem nutrient, subobjectives were established.

Calcium, magnesium, vitamin A: Calcium, magnesium, and vitamin A allowances are relatively easily met by wise food selection. Calcium allowances can be met by including foods from the milk, cheese, and yogurt group regularly. Magnesium can be provided by frequent selection of dark-green leafy vegetables, dried beans and peas, whole-grain breads, whole-grain cereal products, and milk. Vitamin A allowances are easily met by including dark-green or deep-yellow vegetables frequently. The subobjective for this system is to suggest foods to meet the RDA for calcium, magnesium, and vitamin A at all food energy levels.

Vitamin B<sub>6</sub>: Vitamin B<sub>6</sub> has been identified as a problem nutrient because the intakes over 3 days of about 50 percent of the 1977-78 NFCS survey population were below 70 percent of the value in the RDA table (33). The vitamin B<sub>6</sub> requirement is recognized to vary with protein intake, and the basis for allowances established by the Committee on Dietary Allowances is 0.02 mg of vitamin B<sub>6</sub> per gram of protein (20). The levels of dietary protein used to determine the vitamin B<sub>6</sub> recommendations in the RDA table are higher than those consumed by most individuals. If, rather than the RDA table value, the standard of 0.02 mg of vitamin B<sub>6</sub> per gram of protein is used, vitamin B<sub>6</sub> is not a "problem nutrient" (32, 37). Although this food guidance system is evaluated by both standards, the subobjective of the system is to ensure a minimum of 0.02 mg vitamin B<sub>6</sub> per gram of protein.

Iron: Meeting the recommended level of iron is a problem for certain sex-age groups that have relatively high allowances for the nutrient but typically low food energy intakes: toddlers, teenage girls, and women of childbearing age. For example, to meet the recommendation of 18 mg of iron in 2000 calories, a woman must consume a diet that provides 9 mg of iron per 1000 calories. The average intake reported by the 1977-78 NFCS for all individuals was only 6.8 mg of iron per 1000 calories (30). Careful food selection is necessary to approach the recommended levels for iron. NFCS data indicate that diets of most women do not contain the recommended amounts of iron. For example, around 40 percent of all adult women (23-50 years) surveyed had food energy intakes less than 1400 calories. This group of women had average iron intakes that were only 44 percent of the RDA (33). Even women with food energy intakes equal to or greater than the midpoint of the recommended range (2000 calories) had iron intakes that averaged only 87 percent of the RDA. A similar relationship was shown for teenage girls (33). The difficulty of meeting the recommended levels of iron in diets by these groups is recognized, and the food guidance system is not expected to overcome this difficulty entirely. The subobjective for this system is to increase iron consumption substantially over currently reported intakes at the lowest food energy levels, and to achieve the RDA for iron at higher food energy levels.

Zinc: Zinc has been considered in previous food guidance development only to a very limited extent because of lack of food composition data on a sufficient number of foods (28). Increased interest in zinc, due to research that identified marginal intakes in some sex-age groups (20), and more food composition data have prompted estimates of zinc in the national food supply (36) and in food consumption patterns derived from the 1977-78 NFCS (34). The current estimated level of zinc in the



national food supply is 12.0 mg per person per day (36). This is less than the recommended allowance for individuals over 10 years of age (15 mg/day). In food consumption patterns that were adjusted to the midpoint of recommended food energy intakes, zinc was 69 percent of the RDA for adult women and 97 percent for adult men (34). It is apparent that--even with careful food selection--the recommended level of zinc for adults is difficult to meet, especially at lower food energy levels. Thus, the subobjective of the system is to increase zinc consumption substantially over current reported intakes at lower food energy levels, and to achieve the RDA for zinc at higher food energy levels.

Folacin: There are limited data for the folacin content of foods (27, 28). The current estimated amount of folacin in the national food supply is less than 300 g per person per day (Note 1), compared with a recommended allowance for those 10 years or older of 400 µg. Estimates of folacin in food consumption patterns derived from the 1977-78 NFCS survey, adjusted to the midpoint of recommended food energy ranges, are 71 percent of the RDA for women and 88 percent for men (34). USDA specialists indicate that these folacin estimates were based on very limited and sometimes conflicting data. Although more data are now available, the reliability of analytical methods for measuring folacin in foods remains questionable. For this reason it was considered unwise to establish a specific objective for a level of folacin or to make recommendations for changes in food consumption patterns solely to improve folacin intakes. Estimates of the folacin content of diets suggested by the food guidance system were made based on the current state of knowledge for this nutrient, and information is provided in the nutrition course materials to identify food sources of folacin.

Nutrients without RDA: In addition to nutrients for which RDA have been established, other nutrients are known to be needed for good health (20). For some of these vitamins and trace minerals, "safe and adequate" ranges of intake have been established by the Committee on Dietary Allowances. For others, there is insufficient research to establish desirable levels. Food composition data are insufficient for most of these nutrients (28), and thus they cannot be considered individually in development of a food guidance system. The Committee on Dietary Allowances (20) states, "RDA should be met with a wide variety of foods.... It has not been possible to set RDA for all the known nutrients. RDA serve, rather, as a guide such that a varied diet meeting RDA will probably be adequate in all other nutrients. Therefore, it is important to plan a diet to meet the RDA with a wide variety of foods rather than to depend heavily on a more limited selection fortified

only in nutrients for which an allowance has been set (cereals, juice substitutes, etc.)." Thus, the third nutrient adequacy objective for the system is to encourage selection of a wide variety of foods to help assure adequate amounts of nutrients for which no RDA or safe and adequate ranges are set or for which insufficient food composition data are available to estimate content in diets.

#### Total Fat

Goal: To assist individuals in moderating the level of fat in their diets.

Dietary fats are an important component of U.S. diets. They are responsible for some of the characteristic flavors and textures of foods, and they help satisfy the appetite. They also aid in absorption of fat-soluble vitamins (A, D, E, K) and are a source of the essential fatty acid, linoleic acid, which the body uses to make cell membranes and prostaglandins. However, excessive levels of dietary fat can present problems. Dietary fat is a concentrated source of energy, providing about 9 calories per gram, compared to about 4 calories for equivalent amounts of carbohydrates or protein. Therefore, moderation of dietary fat is especially important in low-calorie diets. Eating extra saturated fat and cholesterol will increase blood cholesterol levels in most people; and a high blood cholesterol level increases the risk of heart disease (16). A high fat intake has also been related to increased risk of certain cancers (38).

There is no consensus on what is an appropriate level of dietary fat for healthy people. The National Academy of Sciences, Committee on Diet, Nutrition, and Cancer (38) suggests 30 percent of calories from fat as a target. The American Heart Association recommends that the general population aim for a level of 30 to 35 percent of calories from fat (39). The Committee on Dietary Allowances recommends that total fat intake, particularly in diets of below 2000 calories, should be reduced so fat is not more than 35 percent of food energy (20). Other groups, such as the Food and Nutrition Board (40), believe that specific guidance on fat intake is only appropriate for high-risk populations. The Dietary Guidelines state that a reduction in current intake of total fat, saturated fat, and cholesterol is sensible for the U.S. population as a whole and especially for people who have high blood pressure or who smoke (16).

Data from 1977-78 NFCS (30) indicate that individuals consumed an average of 41 percent of calories from fat. Only around 15 percent of adult men (23 to 50 years) and 18 percent of adult women (23 to 50 years) reported diets over a 3-day period

that provided less than 35 percent of calories from fat (33). Findings from the LRC Prevalence Study were similar (31).

Recommendations for reducing the level of fat in the diet refer to fat from all sources, not to fat in particular foods. There are many ways in which foods that vary in level of fat can be combined to yield diets moderate in fat. Fat is an integral part of many foods--such as meat, fish, or poultry--that contribute important nutrients to the diet. No food items, even those high in fat, need to be eliminated from the diet if they are balanced by also choosing other items that are lower in fat.

The objectives relative to total fat for this food guidance system are (1) to provide guidance that, if followed, would be expected to result in diets in which 35 percent or less of food energy is from fat; (2) to identify sources of fat in the diet; and (3) to suggest ways to reduce fat used in food preparation and at the table and ways to balance foods that are high in fat with foods that are low in fat.

#### Fatty Acids

Goal: To encourage individuals to vary the types of fat in their diets.

The Dietary Guidelines suggest avoiding too much saturated fat as well as total fat (16). Recent recommendations by the Committee on Diet, Nutrition, and Cancer (38) placed major emphasis on the reduction of total dietary fat rather than the reduction of specific types of fat. However, recommendations for dietary modification to reduce blood cholesterol levels emphasize reduction of saturated fat, along with moderate increases in polyunsaturated fat (41-43). The American Heart Association (39, 43) recommends a reduction in level of saturated fatty acids to less than 10 percent of calories and a modest increase in polyunsaturated fatty acids to around 10 percent of calories for healthy people. The Committee on Dietary Allowances (20) suggests a maximum of 10 percent of calories from polyunsaturated fat.

In the LRC Prevalence Study (31), saturated fatty acid intakes averaged around 15 percent of calories for the white adult population aged 20 to 54. Only 10 percent of the population reported intakes of saturated fatty acids less than or equal to 10 percent of calories for a 24-hour period. Intakes of polyunsaturated fatty acids averaged 6.6 percent and 7.0 percent of calories for adult men and women, respectively.

Fats from animal foods tend to have a larger percentage of calories from saturated fatty acids than fats from vegetable



foods. However, certain vegetable fats such as coconut and palm oils have a high percentage of saturated fatty acids.

The objectives for the food guidance system are (1) to provide information on sources of saturated and polyunsaturated fat and (2) to suggest that individuals vary the types of fat they use.

#### Complex Carbohydrates

Goal: To assist individuals in selecting diets that provide adequate amounts of starch and fiber.

The Dietary Guidelines include the recommendation to eat foods with adequate amounts of starch and fiber (16). Major sources of energy in the average U.S. diet are carbohydrates and fats. Because the guidelines also recommend avoiding too much fat and too much carbohydrates provided by caloric sweeteners, for many Americans the complex-carbohydrate content of the diet should be increased to meet energy needs. Foods that are good sources of complex carbohydrates--that is, starch and dietary fiber--include legumes, fruits, vegetables, and grain products. These foods are also sources of essential nutrients, some of which are low in the diets of many Americans.

Eating more foods that are good sources of dietary fiber tends to reduce the symptoms of some chronic bowel problems such as chronic constipation, diverticulosis, and some types of "irritable bowel" (16). Several expert groups (44) have recommended increased consumption of dietary fiber; however, the role of dietary fiber in health is not well understood (45). Also, there is currently no universally accepted method for determining the total dietary fiber content in foods. Some research has suggested that an increased level of fiber in the diet may inhibit mineral absorption. Scientists at a recent symposium on dietary fiber in health and disease concluded that in developed countries such as the United States where a wide variety of food is consumed, it is unlikely that a diet rich in fiber would have an adverse effect on mineral availability (46). However, they cautioned that the increasing publicity about the benefits of dietary fiber may result in excessive intakes that could be of concern.

The objective of this food guidance system is to increase consumption of foods high in starch and dietary fiber--fruits, vegetables, and breads and cereals, especially whole-grain types. This supports other objectives that aim to increase the intake of problem nutrients and to moderate the intake of fat.

#### Sugar and Caloric Sweeteners

Goal: To assist individuals in moderating the level of sweeteners in their diets.

Sweetness in foods is a characteristic many Americans like. Moderation of sweeteners in diets has been recommended as a dietary guideline for the general population (16). In this paper, "sweeteners" refers to cane and beet sugars, corn syrups and sweeteners, honey, molasses, and other edible syrups. These caloric sweeteners contribute food energy but few nutrients to diets. "Sweeteners" does not include naturally occurring sugars in fruit, vegetables, and dairy products.

The major health problem from consuming too much sugar is dental caries (16). All types of sugars, both naturally occurring and refined, can promote tooth decay, particularly if consumed in sticky forms (47). In 1983, the American Dental Association stated "Dental researchers have learned in recent years that foods that contain starches can also cause the bacteria in plaque to produce acid. Starches are found in cereals, breads, vegetables, fruits, and processed foods. It is not yet clear to what extent eating starchy foods is a factor in tooth decay. Many researchers believe that starchy foods can be dentally harmful if they are allowed to remain in the mouth and on the teeth for a long enough time. Other researchers, however, feel that these foods are not dentally harmful unless they also contain some kind of sugar or are eaten along with other foods that contain sugars" (47).

One estimate of average sweetener consumption by individuals, based on 1-day dietary records from the 1977-78 NFCS, is about 12 percent of calories (48). Children and teens had higher intakes. In 1977, the Senate Select Committee on Nutrition and Human Needs proposed a goal of 8 to 12 percent of total calories from refined and processed sugars (42). The Committee on Dietary Allowances has suggested that individuals with calorie needs of less than 1800 to 2000 calories limit calories from sweeteners to allow intake of more nutrient-dense foods (20).

The objectives of this guidance system are: (1) to provide guidance that, if followed, would be expected to result in diets in which 12 percent or less of food energy is from sweeteners and (2) to provide information on food sources of sweeteners and ways to reduce use of sweeteners in cooking.

#### Alcohol

Goal: To encourage individuals who consume alcoholic beverages to moderate their intake.

Moderation in alcohol consumption for those who drink is recommended as a dietary guideline for the general population (16). Excessive alcohol consumption may cause cirrhosis of the liver and some neurological disorders. Alcohol contributes calories but few nutrients to the diet. A recent major study showed a positive correlation between maternal alcohol consumption



and risk of fetal abnormality (49). Because research has not yet determined what is a safe level of maternal alcohol consumption (below which embryotoxic and teratogenic effects from alcohol are nonexistent) many experts recommend that pregnant women avoid alcoholic beverages (50, 51). The LRC Prevalence Study found that the average energy intake from alcohol for adult white men and women (20 to 49) who drank alcoholic beverages was about 320 and 190 calories per day, respectively (31). This was approximately 10 percent of calories. The objective for this guidance system is to provide information about the calorie content of alcohol and alcoholic beverages and about some problems related to excess consumption.

## Cholesterol

Goal: To assist individuals in moderating the level of cholesterol in their diets.

Elevated serum cholesterol levels increase risk of developing coronary heart disease (16). Eating extra saturated fat and cholesterol will increase serum cholesterol levels in most people. However, there are wide variations in the way individuals are able to handle specific intakes of saturated fat and cholesterol. Moderation of cholesterol intake has been recommended as a dietary guideline for the general population. Some studies have shown that dietary cholesterol alone has significantly less effect than saturated and polyunsaturated fat on blood cholesterol levels (52). Eggs are a major source of cholesterol in the diets of adult Americans (53), and studies have reported wide variation in effects of egg consumption on blood cholesterol among healthy individuals (54-57). For example, some experience no increase in blood cholesterol, while others show a significant increase.

Data from NHANES I (1971-74) (53), the LRC Prevalence Study (1972-76) (31), and NHANES II (1976-80) (29) indicate that mean daily cholesterol intakes for adult men (within the age range of 18 to 44 years) were about 520 mg, 495 mg, and 460 mg, respectively. The mean daily cholesterol intakes for adult women within the same age range from these studies were about 310 mg, 335 mg, and 280 mg, respectively. The reduction in dietary cholesterol intake (about 10 percent) between the 1971-74 and 1976-80 studies may be largely accounted for by a decrease in egg consumption. Per capita consumption of eggs decreased about 12 percent from 1970 to 1980 (58).

There is some disagreement among experts about recommendations to the general public on dietary cholesterol. Some scientific groups, such as the Food and Nutrition Board and the American Medical Association, believe that no recommendation should be made about cholesterol intake for the general public (40, 59). Other groups have made such recommendations. The American

Heart Association recommends that the general public consume no more than 300 mg of cholesterol per day (39). The Dietary Goals published in 1977 by the Senate Select Committee on Nutrition and Human Needs recommended a range of 250 to 350 mg of dietary cholesterol per day (42).

The Dietary Guidelines recommend that Americans avoid too much fat, saturated fat and cholesterol (16). The objective for this system is to provide guidance that, if followed, would be expected to result in diets with an average of 350 mg or less cholesterol.

#### Sodium

Goal: To assist individuals in moderating the amount of sodium in their diets.

The major health risk of excessive sodium intake is for persons who have hypertension (16). However, at present there is no reliable way to predict who will develop hypertension. Because most Americans consume more sodium than they need, moderation has been recommended as a dietary guideline for the general population. Estimates of sodium consumption based on 3-day dietary records from 1977-78 NFCS indicate a mean intake for adult males and females (19 to 50 years old) of 3300 mg and 2200 mg of sodium per day, respectively (60). Similar levels were estimated for NHANES II (29). These levels represent only sodium occurring naturally in foods and sodium added in food processing. Salt added in cooking or at the table was not included. Estimates of sodium consumption that include table salt range up to 6900 mg per day (61). The Select Committee on GRAS Substances estimated that adults average a daily intake of 4000 to 4800 mg, including about 1200 mg of naturally occurring sodium, 1600 to 2400 mg commercially added, and 1300 to 2600 mg added in cooking or at the table (62). The Committee on Dietary Allowances recommends a "safe and adequate" level of sodium intake for healthy adults of 1100 mg to 3300 mg per day (20). For healthy children and adolescents recommended "safe and adequate" levels of sodium range from 325 mg to 2700 mg per day.

The objectives for this food guidance system are (1) to provide guidance that, if followed, would be expected to result in diets within the "safe and adequate" range for adults--1100 to 3300 mg; (2) to provide information on sources of dietary sodium and on ways to balance selections of foods that are high in sodium with those that are low in sodium; and (3) to show ways to flavor foods in cooking or at the table using little or no salt or other condiments that are high in sodium.

#### Usability

Goal: To be understood, remembered, and effectively used by the intended audience.



Ingenious, technically accurate food guidance fails unless it can be understood and used by the intended audience (1). Usability is probably the most essential element of a food guidance system. To this end, several objectives were established for the design of the system to make it potentially usable by American adults.

Traditionally, nutrition educators have organized foods into groups that have certain common nutritional characteristics to explain their contribution to diets (1, 63, 64). While some nutrition educators and researchers have been critical of the food group approach (65-68), others have praised it (40, 44, 59, 69). Recently, several new approaches have been suggested. These include systems based on nutrient density or the nutrient content of foods (70-72). Others have revised the current guides or developed new ways in which foods could be grouped (73-78). Others have suggested that foods be grouped by the way consumers perceive them (79-80). New ways for presenting nutrition information may have certain advantages. However, adapting previous approaches avoids some of the problems encountered by both educator and learner when trying to apply a new system. Currently, there appear to be many reasons to continue--and no compelling reason to discontinue--the use of the food group approach. Thus, the first objective is to design a food guidance system using food groups as an organizing framework for the nutrition information presented and, as far as possible, to pattern food groups after those previously used.

A food guidance system should reflect the diversity of foods available and the ways those foods are popularly used. Thus, the second objective is to present the kinds of foods that most Americans eat, in various forms and styles of preparation, and to illustrate the nutritional contributions these foods make to diets.

Because the system is to be used by individuals with varying patterns of eating, it should allow as much flexibility as possible in selecting foods to meet nutritional objectives. For example, food groups should be designed to allow individuals the maximum freedom to choose among a number of different foods. The nutrient adequacy of diets based on this system should not depend on the selection of a few food items that are excellent sources of hard-to-get nutrients or on foods that are fortified with large amounts of one or more nutrients. Rather it should depend on the use of a variety of foods within each food group or subgroup based on typical selections by Americans as indicated by national surveys. Individual food preferences should also be accommodated by allowing for choice among food sources of fat, added sweeteners, and sodium. Thus, another objective is to provide a guide that allows maximum flexibility

in selecting foods to meet nutrient needs at appropriate food energy levels while avoiding too much fat, sweeteners, and sodium.

Most Americans share meals with other people. Therefore, the guidance system should be designed so that it can be used by families and other groups eating together (1, 81). The final objective is to develop a framework for food choices that allows individuals differing by sex, age, and level of physical activity to meet their nutrient and energy needs by choosing different amounts of food from the same menu.

## **FRAMEWORK FOR NUTRIENT COMPONENTS OF THE FOOD GUIDANCE SYSTEM**

This food guidance system evolved from earlier food guides (13-15) and menus based on the Dietary Guidelines developed for "Ideas for Better Eating" (17). In developing those menus at two food energy levels (1600 and 2400 calories), specific dietary planning constraints related to nutrient adequacy and moderation of fat, cholesterol, sodium, and sweeteners became apparent. The diet planning strategies found effective in developing those menus were generalized and refined to provide the basis for the food guidance system in "Better Eating for Better Health."

The framework of this food guidance system is a core of major groups of nutrient-bearing foods with suggested ranges of servings from each group. These are illustrated by the Food Wheel in "Better Eating for Better Health" (Appendix I) and are listed in Table 2. The primary emphasis in developing this framework--meeting protein, vitamin, and mineral needs--is discussed in detail in this section. The next section discusses food energy constraints and strategies for moderating dietary fat, cholesterol, sodium, and added sweeteners in the context of this framework for selection of nutrient-bearing foods.

Separating the discussion of issues relating to nutrient adequacy and moderation illustrates the flexibility of the food guidance system and parallels its presentation in "Better Eating for Better Health." However, both the framework of nutrient-dense foods and the strategies for moderation of dietary fat, cholesterol, sodium, and sweeteners are essential for proper application of this food guidance system. Issues and objectives relating to nutrient adequacy and moderation were of necessity considered together in developing and refining the system.



## Major Food Groups

The food groups in the the Hassle-Free Guide to a Better Diet in "Food" (15) provided the starting point for the development of the food groups in this system. When Page and Phipard (82, 83) developed the "Basic Four," certain food groups were emphasized because they contained one or more nutrients that were thought to be low in American diets in the 1950's. This same approach was used for the current system, where calcium, iron, magnesium, zinc, vitamins A and B<sub>6</sub>, and folacin were identified for special emphasis. To meet other objectives it was necessary to also consider sources of fat, cholesterol, sweeteners, and sodium in foods. Finally, to meet objectives related to usability, each of the food groups had to include foods that are commonly used (84, 85, Note 2). Table 2 summarizes the food groups and subgroups developed for this guidance system. The Food Wheel in "Better Eating for Better Health" provides a visual representation of the food groups and subgroups. The Food Wheel and A Day's Worth of Food and Nutrients are reproduced in Appendix I.

Vegetables and fruits appeared in three groups in guides used in the 1940's and early 1950's (7-13). These included a group of foods that were good sources of vitamin C (citrus, melons, berries, cabbages, and dark-green vegetables), a group of foods that were good sources of vitamin A (dark-green vegetables and deep-yellow fruits and vegetables), and a group that contained all other fruits and vegetables. The developers of the "Basic Four" combined fruits and vegetables into a single group with recommendations to include a good or fair source of vitamin C daily and a good source of vitamin A every other day (82). To accommodate the expanded list of "problem nutrients," and to recognize the fact that fruits and vegetables are used differently in diets (Note 2), a new way of grouping fruits and vegetables was developed for this food guidance system. That is, fruits and vegetables were divided into separate groups, with emphasis on certain subgroups within each of them.

Fruits: Within the fruit group, those fruits that are good sources of vitamin C (citrus fruits, melons, and berries) are highlighted. Whole raw fruits, particularly those with edible skins and seeds, are noted as good sources of fiber. The "added sugar" in fruits frozen or canned with sweeteners is illustrated by "trade-offs" discussed on page 30.

Vegetables: Vegetables are divided into three subgroups, each with different nutrient contributions--dark-green and deep-yellow; starchy, including dried beans and peas; and others.

Dark-green leafy vegetables are sources of a number of nutrients, including vitamin A, folacin, iron and magnesium--all of which tend to be low in American diets. These vegetables are combined

into a subgroup with deep-yellow vegetables, which are also excellent sources of vitamin A. It is suggested that several servings of dark-green leafy vegetables be included each week.

A second subgroup, starchy vegetables, includes dried beans and peas and other vegetables having 50 percent or more of their carbohydrate content as starch--corn, potatoes, green peas, sweet potatoes, and rutabagas. Dried beans and peas, like other starchy vegetables, are valuable sources of starch and dietary fiber, and contain other nutrients frequently low in American diets--vitamin B<sub>6</sub>, folacin, iron, and magnesium. Dried beans and peas are also sources of protein and zinc. In earlier guides, they were grouped with nuts and seeds and labeled as meat alternates. The Food Wheel shows dried beans and peas in an overlapping position between the vegetable group and the meat, fish, poultry, and egg group. This overlapping position is to encourage the use of these foods as a starchy vegetable as well as an alternate for meat. It is suggested that dried beans and peas be included several times a week.

The third subgroup of vegetables is titled "other." This group includes all vegetables that do not fit in the dark-green and deep-yellow group or the starchy group. These vegetables contribute dietary fiber and are sources of a variety of nutrients.

Meat, fish, poultry, and eggs: Foods in this group are good sources of protein and contribute iron, zinc, niacin, and vitamins B<sub>6</sub> and B<sub>12</sub>. The meat, fish, poultry, and egg group does not include beans or other meat alternates in its name. This recognizes that most Americans include some meat, poultry, and fish in their diets on a regular basis (85, 86, Note 2). This food guidance system is based on that practice, and thus it is not appropriate for vegetarians. For Americans who occasionally use dried beans, peas, or nuts and seeds as meat alternates, amounts that are approximately equivalent in most nutrients to lean meat, fish, or poultry are shown as "trade-offs." See page 30 for a discussion of "trade-offs."

Milk, yogurt, and cheese: Most food guides developed since the 1930's (6-15, 76, 77, 87) have included a milk or dairy group. Foods made from milk are a major source of calcium in U.S. diets (30, 88). To emphasize those dairy foods that are better sources of calcium, the dairy group is titled the milk, yogurt, and cheese group. Items high in fat such as butter and creams are grouped with fats. Frozen desserts such as ice cream are considered with grain-based desserts and snacks in a special section titled milk- and grain-based desserts and snacks. "Trade-offs" are used to illustrate those dairy foods that are excellent sources of calcium but are higher



than skim milk in fat or sweeteners. See page 30 for further information on "trade-offs."

Grains, breads, and cereals: Whole-grain and enriched grains, breads, and cereals have always been a prominent part of food guidance (2-13, 75-77, 87). All of them are sources of starch. They also provide iron, which is low in many diets, and thiamin, riboflavin, and niacin. In addition, whole-grain products are sources of folacin, magnesium, zinc, and dietary fiber. Selection of several whole-grain items each day is suggested. Food items that are made with flours but have substantial amounts of fat or sweeteners--cakes, pies, and cookies--are included with frozen desserts in the special milk- and grain-based desserts and snacks section. Although muffins, pancakes, and other quick breads contain more fat than yeast breads and most other cereal products, they were included in the grains, breads, and cereals group because they allow for varied food choices and provide an easy way to introduce whole-grain products into the diet.

Fats, sweets, and alcohol: As in the Hassle-Free Guide (15), foods that are primarily fats--butter, margarines, creams, etc.; primarily sweeteners--candy, sugar, honey, soft drinks, colas, etc.; or primarily alcohol were represented in a group called fats, sweets, and alcohol. "Trade-offs" were developed as discussed on page 30 to show the approximate number of teaspoons of fat and sweetener contained in a serving of some items in this group--chocolate bars and colas, for example. The calorie content of various alcoholic beverages is also presented.

Mixed foods: The examples of foods in each food group and subgroup that are listed in A Day's Worth of Food and Nutrients (Appendix I) do not include all types and forms of food that people may select. Specific activities and information on reading labels are provided in the nutrition course to help individuals decide how to classify mixed and packaged foods into the food groups and subgroups.

One special category of mixed foods includes milk- and grain-based desserts and snacks. These foods, such as ice cream and cake, are combinations of milk or grain plus added fat and sweeteners. They provide the nutrients found in milk and flour but more fat or sugar than foods in the milk, yogurt, and cheese group or in the grains, breads, and cereals group. These foods are discussed with fats, sweets, and alcohol in the nutrition course to encourage moderation in their use. The "trade-offs" described on page 30 illustrate the nutrient as well as the fat and sweetener content of these foods.



## Serving Sizes

The serving sizes specified in this food guidance system are generally based on "typical" serving sizes reported by individuals in the 1977-78 NFCS (85). Serving sizes for nearly all food items varied, particularly by age and sex of the individual reporting. A "typical" serving of a food was defined as the median amount of food consumed at a single eating occasion. Table 2 lists serving sizes used for each food group in this guidance system.

Fruit: The "typical" serving size of most fresh fruit was one average piece and 1/2 cup of cooked or canned fruits. However, the "typical" serving of juice was 3/4 cup--more than assumed in other food guides, but consistent with the size of juice glasses and the individual servings of juice in cans. A 3/4-cup serving for fruit juice was adopted for this guidance system.

Vegetables: Traditionally, the serving size for vegetables has been 1/2 cup and that size is still appropriate for most cooked and raw vegetables. The median serving for raw leafy vegetables, such as lettuce, was unduly small because one or two leaves was often reported, probably used as a garnish on a sandwich or a liner for a salad. Reported weights of tossed salads varied due to the type of ingredients. A serving of 1 cup of raw leafy vegetables was used for this guidance system.

Meat, fish, poultry, and eggs: Serving sizes for meat, fish, poultry, and eggs varied greatly by item type, as well as by sex and age of respondent. Rather than a single serving size, a total number of ounces of lean cooked meat, poultry, and fish per day was used to allow for flexibility in serving size. One egg was considered equal to one ounce of lean meat, poultry, or fish.

Milk, yogurt, and cheese: For children, teens, and adults up to age 34, "typical" servings of milk were around one cup. For older adults 1/2 cup to 3/4 cup was more "typical," with at least 25 percent of the reports being for 1/4 cup or less. This probably represents use of milk in coffee or on cereal. Reports for cheese were either 1 or 2 ounces and yogurt 6 to 8 ounces. The following serving sizes appear to be fairly "typical," and contain amounts of calcium similar to or more than that in 1 cup of milk: 1-1/2 ounces of natural cheese; 2 ounces of processed cheese, cheese food, or spread; and 8 fluid ounces of yogurt.

Grains, breads, and cereals: The "typical" serving for grain products from 1977-78 NFCS data was nearly two slices of bread and 1 cup of cooked cereal, rice, and grains--about twice the one slice or 1/2- to 3/4-cup servings specified in previous

food guides (14, 15). However, these typical serving sizes were not adopted for this food guidance system because the effect of such a major deviation from previous recommendations should be tested before being adopted. The serving size specified for this food guidance system is one slice of bread, a small roll or muffin, one ounce of ready-to-eat cereal, and a half cup of cooked cereal, rice, or pasta. Whole English muffins, bagels, and hamburger buns equal two servings.

**Range of Servings** Suggested ranges of servings for each of the major food groups are shown in Table 2. The ranges of servings were developed based on experience in developing menus for the publication "Ideas for Better Eating" (17). In addition, a series of trials compared the nutrient contents of diets (with different numbers of servings from the major groups and subgroups) with the objectives for levels of protein, vitamins, and minerals in this food guidance system. These trials also considered the objectives related to the range of food energy to be covered; moderation of fat, cholesterol, sweeteners, alcohol, and sodium; and usability of the system. Food energy, moderation, and usability issues will be discussed in later sections of this paper.

**Nutrient Adequacy** For the purpose of assessing nutrient adequacy of the recommended servings, examples A, B, C, D were specified. These are shown in Table 3. The examples represent four of many possible variations that could be selected using the suggested ranges of servings. These examples are not intended as specific recommendations. Rather they were selected for analysis because they span the range of servings suggested by this food guidance system.

Examples A through D were modified for teens and for pregnant or lactating women by including the additional serving of milk which the guidance system suggests for these groups. These modifications are labeled examples A1, B1, C1, and D1. Example A was also modified to be more appropriate for young children with lower food energy needs by reducing suggested amounts of food for all food groups except milk. This modification, called example A2, illustrates one of a number of possible variations in reduced serving sizes that could have been developed.

To assess nutrient adequacy of the food guidance system, composites of foods in each food group or subgroup were developed. Composites reflect the relative use of individual foods within the group or subgroup, as reported in spring 1977 by all individuals surveyed in the NFCS (Note 3). That is, the proportion of a serving from a food group to be represented by a particular food was determined by the frequency of use of that food relative to other items in that food group or subgroup.



It was not possible to include all food items reported from each group in the composites. Foods that were reported infrequently were represented in the composites by others of similar nutrient content. For example, all reports of canned citrus juice were represented in the fruit composite by canned grapefruit juice, the predominant kind of canned citrus juice reported.

The nutrient value of a composite serving for each food group or subgroup was determined using the following assumption: Foods were assumed to be in forms containing the least fat and sweeteners, regardless of the form reported. For instance, all milk products were assumed to be skim milk; meats were included with all trimmable fat removed, and poultry with skin removed; fruits and vegetables contained no added sweeteners or fat; and grains, breads, and cereals were either enriched or whole-grain, without large amounts of added fat or sweeteners. Thus the composites generally represent foods from each food group or subgroup in their most nutrient-dense forms.

The nutrient value of a serving of each of the food composites is shown in Table 4. The nutritive values for each food in amounts representing its proportion of a composite serving were added to determine the nutrient composition for a composite serving of food for each group or subgroup. Food composition data used to develop each composite serving came from USDA sources. These include the first 10 revised sections of Agriculture Handbook 8 (89-98), preliminary tables prepared for release prior to completion of revised sections of AH-8 (99-104), journal articles by USDA nutrient data specialists (105-115), and other USDA publications (116-118). Where no published data were available, values for the nutrient or food constituent were imputed.

Several assumptions were made when servings of the various composites were combined to develop estimates of the nutrient adequacy of diets planned following the recommendations of the food guidance system. Certain types of foods within several groups were purposely weighted more heavily because they were targeted for greater use than their use in the 1977-78 NFCS would indicate. For example, the three vegetable subgroups (Table 2) were equally weighted. Within these vegetable subgroups the dark-green vegetable composite and the dried bean and peas composite were weighted to reflect their inclusion several times a week. Of every three servings of vegetables suggested in the guide: Three-sevenths of one serving is assumed to be dark-green vegetable and the remaining four-sevenths is deep-yellow vegetable; three-sevenths of the second serving is assumed to be dried beans and peas and the remaining four-

sevenths is other starchy vegetable; and a third serving is "other" vegetable. Within the grains, breads, and cereals group, the whole-grain composite was weighted to reflect the recommendation to include several servings a day of whole-grain products. Three servings a day were assumed in estimating nutritive values of the diets. In the meat, fish, poultry, and egg group, use of one-half of an egg per day, or three to four eggs per week, was assumed.

Example A (Table 3) is a combination of two servings of composite fruit; three servings of composite vegetables; 4-1/2 ounces of meat, fish, and poultry composite and one-half of an egg; two servings of skim milk; and six servings of grains, breads, and cereals. The estimated amounts of nutrients provided by example A are shown on Table 5. Using the number of servings shown on Table 3 and the procedures described above, the estimated amounts of nutrients provided by examples B, C, and D are presented in Tables 6, 7, and 8 respectively. These amounts of nutrients represent expected levels for the examples composed of average selections of foods from each food group and subgroup as specified in the food guidance system. The tables also list nutrient attainment for each example in terms of percentage of the RDA for sex-age groups for which the example might be appropriate. That is, the number of nutrient-dense servings from food groups in the example, plus moderate amounts of fat and sweeteners, would provide food energy within the range recommended by the Committee on Dietary Allowances for the selected sex-age group. This is discussed beginning on page 26.

Table 5 shows that example A, representing the bottom of the range of servings suggested by the food guidance system, meets recommended allowances for all nutrients for children 4 to 6 years and for most nutrients for children 7 to 10 years and adult women over 19. Of the seven nutrients identified as "problem nutrients"--vitamins A and B<sub>6</sub>, folacin, calcium, iron, magnesium, and zinc--example A meets allowances for calcium and vitamin A for the sex-age groups listed and provides 95 percent or more of the allowance for magnesium. Vitamin B<sub>6</sub> is provided by the pattern at 0.02 mg per gram of protein, although this is only 79 percent of the RDA value for adult women. Iron is below allowance levels for women of childbearing age but is above the levels reported by these women in surveys (30). Zinc is below allowance levels for women but is above levels estimated from food patterns for women at 2000 calories derived from the 1977-78 NFCS (34). In spite of emphasis on good sources of folacin (fruits, vegetables including dark-green leafy and dried peas and beans, and whole-grain products), folacin levels in example A provide only 61 percent of the RDA for women. Thus, example A fails to meet allowances for



iron, zinc, and folacin for some sex-age groups, but improves consumption of these nutrients over levels reported or estimated from survey data. Tables 6 through 8 show the percentages of the RDA for selected sex-age groups provided by examples B, C, and D. The additional servings of foods from the major groups provide iron, zinc, and folacin in amounts that approach or exceed the RDA.

Table 9 shows estimated levels of nutrients provided by the examples that have been modified for young children, for teens, and for pregnant and lactating women. For the young child, amounts of foods in example A were reduced by one-third, with the exception of milk. This is labeled example A2. For teens and pregnant and lactating women, the examples were modified by addition of one serving of milk. These are labeled A1, B1, C1, and D1.

The 2 cups of milk (or its equivalent) was retained in example A2 for young children to help provide the RDA for calcium (Table 9). However, example A2 provides only 8.2 mg of iron, 55 percent of the RDA for 1 to 3 year olds. In the 1977-78 NFCS, 48 percent of 1 to 2 year olds had intakes of less than 50 percent of the RDA (30). The recommended iron allowance for 1 to 3 year olds is difficult to meet at food energy levels appropriate for this age group. Course materials suggest discussing with the child's doctor the need for iron supplements or for iron-fortified foods.

Example A1 (Table 9), a modification of example A, provides the RDA for calcium and most other nutrients for teenage girls but only 68 percent of the RDA for iron. This is slightly higher than the average intake of iron (65 percent of the RDA) reported by teenage girls 12 to 14 years on the 1977-78 NFCS (30). It is much higher than the 46 percent of the RDA for iron consumed by the one in five girls of this age who consumed less than 1540 calories (33). Consuming additional amounts of foods, as in example B1, increases the iron to 86 percent of the RDA.

While examples B1 and C1 (Table 9) provide the RDA for calcium for pregnant and lactating women, they only provide between 15 and 17 mg of iron. They also provides only about 40 percent of the RDA for folacin for pregnant women and 68 percent of that for lactating women. The Committee on Dietary Allowances recommends 30 to 60 mg of supplemental iron for pregnant and lactating women (20). They also state that supplementation of folacin appears desirable during pregnancy. We have found that allowances for other nutrients such as vitamin B<sub>6</sub>, magnesium, and zinc are also difficult to meet at appropriate calorie levels during pregnancy and lactation. Supplementary materials in "Better Eating for Better Health" indicate that

multivitamin-mineral supplements are often prescribed during pregnancy and lactation to cover higher estimated needs for all nutrients under these conditions.

#### Food Sources of Nutrients

The food sources of nutrients in example B are shown in Figure 2. Contributions of food groups to the amounts of "problem nutrients"--calcium, iron, magnesium, zinc, vitamin A, vitamin B<sub>6</sub>, and folacin--are expressed as percentages of the RDA for adult women (23 to 50 years of age) (20).

Three-fourths of the calcium allowance is provided by the milk, cheese, and yogurt group. The remainder is primarily from the grains, breads, and cereals group and the vegetable group.

The largest proportion of the iron in example B is provided by grain products, followed by the meat and vegetable groups. Both enriched and whole-grain products are important sources of iron. The iron contribution from vegetables is primarily from the several servings per week suggested from dark-green leafy vegetables (9 percent of a woman's RDA per serving) and dried beans and peas (18 percent of a woman's RDA per serving). The meat group has long been valued as a major source of iron in U.S. diets (82). A 3-ounce serving of the meat, fish, poultry composite provides around 10 percent of a woman's RDA for iron. Part of the iron in meat, fish, and poultry is in the form of heme iron, which is more readily absorbed than the nonheme iron found in plant foods (119).

Nearly two-thirds of the magnesium comes from grain products and vegetables. Whole-grain products contribute significantly to the magnesium level. A single whole-grain serving provides around 9 percent of a woman's RDA, and several servings are suggested daily. Similarly, use of several servings each week of dark-green leafy vegetables (10 percent of a woman's RDA per serving) and dried beans and peas (16 percent of a woman's RDA per serving) enhance the magnesium contribution of the vegetable group.

Zinc is provided primarily by the meat group, with smaller amounts contributed by grains, milk, and vegetables. Two subgroups are important sources of zinc--whole-grain products (4 percent of a woman's RDA per serving) and dried beans and peas (6 percent of a woman's RDA per serving).

The major portion of the vitamin A value in example B is provided by the vegetable group. Levels are well above those in U.S. diets because of emphasis on use of dark-green and deep-yellow vegetables for improving levels of other "problem nutrients." Vitamin B<sub>6</sub> is provided primarily by the meat, fish, poultry,



and egg group and by the vegetable group. Smaller, but important, amounts are provided by other groups. Folic acid is widely distributed in small amounts in foods, with fruits, vegetables, and grain products providing more than meat or milk. Within the vegetable group, dark-green leafy vegetables and dried beans and peas are particularly good sources (14 and 9 percent of a woman's RDA per serving, respectively). A serving of fruit provides around 6 percent and whole-grain products around 3 percent of the RDA per serving. While these foods contribute significant amounts of folic acid, they also contribute other nutrients such as vitamins A and B<sub>6</sub>, iron, magnesium, or zinc. No foods were highlighted solely for folic acid content because food composition data on folic acid are not sufficiently reliable to serve as a basis for food guidance decisions (27, 28).

This analysis of examples A to D has shown how the objectives listed in Table 1 for levels of protein, vitamins, and minerals in diets are met by selecting nutrient-dense foods from several major food groups and subgroups. The guidance system emphasizes food sources of nutrients rather than vitamin and mineral supplement products or particular foods fortified with large amounts of one or more nutrients. This helps assure adequate amounts of those nutrients not assessed or for which no RDA have been established. The next section discusses food energy and strategies for moderation of dietary fat, cholesterol, sodium, and added sweeteners in diets that are based on this framework of nutrient-dense foods.

## **FOOD ENERGY, FAT, SWEETENER, CHOLESTEROL, AND SODIUM COMPONENTS OF THE FOOD GUIDANCE SYSTEM**

Examples A through D developed from nutrient-dense composites are unrealistically low in fat and sugar--17 to 18 percent of calories from fat and less than 1 percent of calories from added sweeteners. Individuals are expected to make alternate food choices and to use additional fat and sugar in cooking or at the table which will increase the fat and sweetener content of their diets. The amounts and types of fats and sweeteners added to Examples A through D will affect the total calories as well as the amounts of total fat, fatty acids, cholesterol, and added sweeteners. However, the additional fat and sweeteners will not substantially affect amounts of protein, vitamins, and minerals provided in diets represented by the examples.

The food energy and nutrient content of one teaspoon of composites of "added fat" and "added sweetener" are shown in Table 10.



These composite nutrient values were developed using the proportions of fat or sweeteners available from various sources in the national food supply, 1980 (58, 88). Components of the "added sweetener" composite include beet and cane sugar, corn sweeteners, and honey (58). The composite of "added fat" includes meat and poultry fat, butter, lard, margarine, other vegetable shortening, and vegetable oils. It allows for the use of higher fat items from the major groups such as whole milk or luncheon meats, as well as fats added in preparation or at the table. Because foods in the nutrient-dense composites used for examples A through D contained a small amount of fat, the "added fat" composite was adjusted to account for the types of fat already present. For example, the proportion of meat fat in the "added fat" composite was reduced to account for the fat already present in the lean meat composite used in the examples.

#### Food Energy

By adding various numbers of teaspoons of "added fat" and "added sweetener" composites to the examples A through D, total diets with fat levels of up to 35 percent of calories and sweetener levels up to about 12 percent of calories are illustrated (Tables 11 through 14). The amounts of "added fat" and "added sweetener" determine the food energy level. The range of food energy illustrated is from about 1400 to 3200 calories. The addition of alcohol to the examples is not illustrated here, but it is illustrated in the section "Using the Food Guidance System to Plan Menus," page 35. Its effect would be to add calories unless the amounts of "added fat" or "added sweetener" were reduced. The addition of alcohol would also change proportions of calories from the other energy-yielding nutrients.

Table 15 shows the range of calories when moderate amounts of fat and sweeteners are added to example A2. This calorie range (1000 to 1380) reflects the food energy needs of many young children.

Figure 3 graphically presents the food energy ranges of examples A through D with various amounts of fat and sweeteners added. Ranges of energy for examples A1 through D1, adjusted for teens and pregnant and lactating women by adding 1 cup of milk, are shown in Figure 3 but not in the tables.

The objective established for food energy was to develop a framework for selecting of diets which, with moderate amounts of fat and sweeteners, would span the recommended calorie ranges (1400 to 3200 calories) for most of the U.S. population. Data presented in Tables 11 through 15 and Figure 3 show that this objective was met.

## Total Fat

Tables 11 through 15 also show an estimate of the percentage of calories from fat for each of the examples. The percentage is dependent not only on the number of teaspoons of "added fat" but also on the number of calories provided by the major food groups and "added sweetener." For instance, the percentage of calories from fat for example A (Table 11) is 27 percent with 4 teaspoons of "added fat" and 0 teaspoons of "added sweetener." For the same amount of "added fat" with 5 teaspoons of "added sweetener," the percentage of calories from fat is 25 percent. The percentages of calories from fat shown by Tables 11 through 15 represent substantial reductions from fat levels reported in the 1977-78 NFCS (30).

The nutrition course materials suggest a number of strategies for reducing the total fat content of the diet. "Trade-offs" are used to indicate the amount of fat in selected food mixtures and processed foods. More specific illustrations of the use of these strategies are in the section "Using the Food Guidance System to Plan Menus." Together, these elements provide a basis for meeting the system objectives for total fat.

## Fatty Acids

Percentages of calories from the three types of fatty acids range from 8 to 12 percent for saturated, from 9 to 12 percent for monounsaturated, and from 5 to 8 percent for polyunsaturated (Tables 11 through 15). These percentages are based on the types of fatty acids in foods from the major food groups and from the "added fat." As previously discussed, the "added fat" composite was based on the sources of fat in the current U.S. diet. The percentage of calories from each type of fatty acid would vary depending on the kinds of foods and fat sources selected. The course provides information on the types of fatty acids in a number of foods and emphasizes the importance of choosing fats from both vegetable and animal sources. The importance of reducing the total fat in the diet is emphasized in all discussions about fat and fatty acids. Thus the objectives for fatty acids are met.

## Complex carbohydrates

Sources of complex carbohydrate and fiber are fruits, vegetables, and grains, breads, and cereals. This food guidance system recommends at least two servings of fruit, three servings of vegetables, and six servings of grain products, including several servings of whole-grain products. Thus the objective of increased consumption of these foods is met. The amount of dietary fiber in the diets of individuals following these recommendations is not expected to cause problems with mineral absorption (46).

## Sweeteners

Tables 11 through 15 illustrate the effect of various amounts of sweeteners on total calories. The objective was to limit added caloric sweeteners to around 12 percent or less of calories.



The "trade-offs" provide information on the approximate amount of sugars and sweeteners in various foods. Course materials also provide information to help identify sweeteners on food labels. These elements provide a basis for meeting the objectives to moderate sweetener intake.

#### Cholesterol

Tables 11 through 15 show the amount of cholesterol provided by each example with varying amounts of fat added. The major source of cholesterol in American diets is egg yolks (53). All of the examples assume the inclusion of the equivalent of one-half egg per day, or three or four eggs per week. One-half egg provides 137 mg of cholesterol. The remainder of the cholesterol in the examples, prior to the addition of "added fat," includes a small amount of cholesterol in skim milk and some from meat, fish, and poultry. Together, meat and dairy items provide around 130 mg of cholesterol in example A and 180 mg of cholesterol in example D. Each teaspoon of "added fat" contains about 4 mg of cholesterol from animal fat. The objective to achieve an average 350 mg or less of cholesterol per day was met at lower food energy levels (Tables 11 through 15). However, for examples C and D with increased food energy levels and amounts of added fat, cholesterol levels exceed 350 mg.

#### Sodium

Estimates of the amount of sodium in the examples range from 1310 mg to 2320 mg (Tables 11 through 14). The range of sodium for example A2, designed for young children, is 960 to 1080 mg (Table 15). These estimates include only the sodium occurring naturally in food or added in processing to foods in the composites. These include breads, canned vegetables, some cured meats, and butter or margarine. The estimates do not include any sodium added during cooking or at the table or sodium from high sodium foods not included in the composites. The amount of sodium increases as the amount of food, and thus calories, increases. The sodium estimates for the examples are all within the "safe and adequate range," 1100 to 3300 mg, established for adults by the RDA Committee (20) and would allow for the addition of modest amounts of discretionary sodium. However, the amounts of discretionary sodium (salt and other high-sodium seasonings used in food preparation and at the table) that could be added and still be within the "safe and adequate" range are generally less than the amounts currently used--1300 to 2600 mg of sodium, as estimated by the Select Committee on GRAS Substances (62). Information about the amount of sodium in various types of foods as well as ways to flavor foods without salt or other sodium-containing compounds is provided in the course materials. These elements combine to meet the objectives for sodium.



## DEVELOPMENT OF "TRADE-OFFS"

Fat and sweeteners are found in American diets as ingredients or components of many foods. "Trade-offs" were developed to illustrate the approximate amounts of fat and sweeteners in such foods, represented as teaspoons of fat and sugar. The "trade-offs" are approximations and should not be used when exact dietary calculations are required. For example, the teaspoons of fat and sugar are rounded to the nearest whole teaspoon, and bread, meat, and milk equivalents are generally rounded to the nearest slice, ounce, or cup, respectively.

In developing the "trade-offs," both nutrients and calories were considered. Primary consideration was given to assuring that one food item being substituted for another would provide approximately the same amount of nutrients for which the original food item was recognized as a good or important source. For example, in the "trade-offs" for skim and whole milk, nutrients such as calcium and protein received primary consideration. Consideration was also given to the contribution of carbohydrates, fat, and total calories.

Table 16 presents four examples of "trade-offs" developed for the nutrition course. The table includes information on the food energy and nutrient content of both sides of the "trade-off" equation to illustrate the approximate nature of the "trade-offs" and to show how they were developed. The first example shows that 1 cup of whole milk provides approximately the same nutrients and calories as 1 cup of skim milk plus 2 teaspoons of fat. The second example illustrates that many baked desserts or snack-type foods are composed of the same basic ingredients found in enriched bread, but contain substantially more fat or sweeteners than enriched bread. To illustrate, a piece of frosted white layer cake made with enriched flour provides amounts of nutrients similar to a slice of enriched bread, but also provides the equivalent of 6 teaspoons of sugar and 3 teaspoons of fat and their added calories. The third example illustrates that the caloric content of 12 ounces of fruit-flavored punch is equivalent to 12 teaspoons of sugar. The fourth example illustrates the use of peanut butter as a meat alternate. Nutrition course materials note that peanut butter and the other meat alternates do not contain vitamin B<sub>12</sub>. Some illustrations of ways to use the "trade-offs" are presented in the section "Using the Food Guidance System to Plan Menus."

## DISCUSSION

A food guidance system organizes information about foods and nutrition in such a way that individuals can apply the information in making food selections expected to promote nutritional health and well-being. It takes into account current knowledge from nutrition science as well as knowledge about how and why individuals make decisions about food.

In developing the food guidance system for "Better Eating for Better Health," we had an exceptional opportunity to provide a framework for food selection; to provide extensive supplementary information in tables and text; and, through various course activities, to provide experience in applying the guidance. Thus, the system consists of multiple components--none of which stands alone. This paper deals primarily with the technical basis for the suggested numbers of servings of foods represented in the Food Wheel and the strategies for moderating fat, sweeteners, and sodium in the total diet. Only brief references are made to supplementary information that is part of the guidance system as it is presented in the course. The reader is referred to the course materials for "Better Eating for Better Health" for a more complete picture of the food guidance system.

Many factors must be considered in developing food guidance for the healthy population. These include nutritional issues such as nutrient adequacy and diet/health concerns, as well as usability issues such as availability and acceptability of foods and eating practices of the population. The intent of this food guidance system was to meet all goals listed in Table 1. This was not always possible. Thus, specific objectives were developed to establish priority among competing goals and provide reasonable criteria for evaluating the guidance system. This is consistent with the recommendation of the Committee on Dietary Allowances, which states that "diets should be composed of a variety of foods that are acceptable, palatable, and economically attainable by the consumer using RDA as a guide to assessment of nutritional adequacy" (20).

Nutrition objectives for this system include provision of diets that contain adequate amounts of essential nutrients at food energy levels appropriate for individuals differing by sex, age, and level of physical activity. Diets are to contain moderate amounts of fat, cholesterol, sweeteners, and sodium. Other objectives are related to the usability of the system. This food guidance system, like previous food guides, uses food groups to identify foods of similar nutrient content that can be used interchangeably in the diet. A system using food groups which evolved from previous widely recognized systems



helps avoid some of the problems encountered by both the educator and learner when trying to learn a new system. The system does not exclude any foods that most Americans eat--it includes fresh and processed foods, as well as mixtures, and has the flexibility to accommodate individual food preferences while meeting nutrition objectives. It is designed for healthy individuals differing in sex, age, and level of physical activity. However, this system is not suitable for everyone. Individuals who for medical reasons or personal choice exclude certain major food categories, such as dairy products or meat, need other guidance to help them meet their nutritional needs.

At the lowest food energy levels, as in example A (Table 11), all nutrients could not be provided at RDA levels without restricting fat and sweeteners to a point that we judged would be unpalatable and unreasonable for a healthy person. The suggested servings of foods from the major groups in example A--those at the bottom of the ranges shown in Table 2--provide sufficient nutrients to meet all nutrient recommendations for children 4 to 6 years old and all except folacin for children 7 to 10. However, neither example A nor example B, which includes some added servings from the major food groups (Tables 5 and 6), provide the woman's RDA for zinc or folacin or the RDA for iron for women under 50. Nevertheless, examples A and B do provide substantial improvements over current consumption of these nutrients, and thus meet the objectives.

The system could have been designed to provide all nutrients at RDA levels at lower food energy levels by prescribing the regular inclusion of highly fortified foods or individual food items that are particularly good sources of "problem nutrients." This option was not adopted. However, nutrition course materials provide additional information about the use of fortified foods and vitamin and mineral supplements to increase nutrient intake.

The guidance system emphasizes the need to moderate fat, sweetener, and alcohol consumption, especially at lower food energy levels, to allow for the increased consumption of more nutrient-dense foods. With moderate amounts of fat and sweeteners, example A provides around 1400 to 1900 calories, which is about the average calorie level reported by adult females in the U.S. (Table 11). However, at fat and sweetener levels common in U.S. diets--an average of 41 percent of calories from fat (33) and 12 percent of calories from sweeteners (48)--the calorie level of example A would be around 2200 calories. It is clear that reduction of fat and sweeteners below levels commonly consumed is essential in using the system for lower calorie diets.



Figure 3 shows that the upper end of the range of food energy for example A overlaps the lower end of the range of food energy for example B with much lower levels of fat and sweeteners. Individuals with food energy needs in this overlapping range have the option of increasing their servings from the major food groups to increase nutrient intake, while not increasing food energy. To do this, they must be willing to be more restrictive in their choices of foods high in fat and sweeteners. An alternative is to increase food energy need by increasing physical activity.

Some individuals may not be able to avoid weight gain even if they select the minimum recommended number of servings from the major groups. Many older women and some teenage and adult women with limited physical activity are among these. However, if these individuals include more foods from the major groups than they have previously, while moderating their use of foods that are sources of calories with few nutrients, their diets will be improved.

In diets at higher food energy levels, RDA for nutrients can be met with less concern about selecting foods low in fat and sweeteners. Instead, the issue becomes one of choosing foods so that total fat and sweeteners in the diet are in the moderate range. To do this, the food guidance system suggests increasing the number of servings from the major groups (as in examples C and D), with only modest additions of fat and sweeteners. The illustrations in Table 14 include 35 percent or less of calories from fat and around 12 percent or less of calories from sweeteners while providing up to around 3200 calories. These diets with higher food energy contain lower levels of fat than most Americans consume and less food energy from sweeteners than many individuals consume.

Meeting objectives for moderation of cholesterol and sodium becomes more difficult at the higher food energy levels. In the example diets, amounts of cholesterol increase as food energy levels increase, even though the amount of egg is kept constant. The objective of 350 mg of cholesterol or less was achieved at lower food energy levels--examples A and B. However, at some of the higher calorie levels in examples C and D, the cholesterol level exceeded 350 mg. Several options were available to reduce the cholesterol level at these higher food energy levels. The number of egg yolks could have been limited to 2 or 3, the amounts of milk and meat groups could have been reduced, or the proportion of animal fat in the "added fat" reduced. These were not adopted because of nutrient adequacy and usability considerations. The highest estimated amount of cholesterol provided by the food guidance system is substantially lower than the average of 460 mg of cholesterol reported for adult males 18 to 44 years of age by NHANES II (29).

Sodium levels in diets also increase as food energy levels increase. The examples range from a low of around 1300 mg in example A to a high of around 2300 for example D. These estimates are within the "safe and adequate range" for adults recommended by the Committee on Dietary Allowances (20). However, to remain within the "safe and adequate" range, individuals at higher food energy levels must limit their use of table salt, other sodium-containing condiments, and high sodium foods to a greater extent than individuals at lower food energy levels. Information is provided in the course on the relative sodium content of a number of foods, and individuals are encouraged to balance higher and lower sodium choices. They are also encouraged to reduce or eliminate sodium added in cooking or at the table.

The "safe and adequate" sodium range suggested for children is lower--600 to 1800 mg for 7 to 10 year olds (20). The recommended food energy range for these children is 1650 to 3300 calories.

Examples C and D, which provide food energy at the middle to upper parts of the recommended range for children 7 to 10, are estimated to provide nondiscretionary sodium at levels that exceed the "safe and adequate" range for this age group (Tables 13 and 14). It would be difficult to develop food patterns for this age group which limit the amount of sodium so that it is within the recommended "safe and adequate" range unless special low-sodium products were recommended. Similar difficulties would be encountered in planning diets for younger children and probably for those teenage boys whose calorie needs exceed 3200 per day.

This discussion has illustrated some of the problems faced in developing this dietary guidance system for the general population. To be useful to the majority of the population, the system must serve individuals with low food energy needs whose food intakes do not meet desired nutrient levels and those with high food energy needs whose diets more easily meet desired nutrient levels. Even if only moderate amounts of fat and sweeteners are included, at low calorie levels the system does not ensure meeting RDA for certain essential nutrients--especially iron and zinc--for some sex-age groups. This does not mean that the lower calorie diets based on the system are inadequate for the people eating them. The RDA are set high to cover the needs of almost all healthy people. Therefore, rather than distort usual consumption patterns unduly and prescribe special iron- and zinc-rich foods to meet the RDA, the guidance attempts to increase levels of these nutrients substantially above current levels. This permits the inclusion of moderate amounts of fat and sweetener and allows more flexibility in selecting individual foods within major food groups.



Diets at high food energy levels can include more nutrient-bearing foods. Because the RDA for nutrients do not increase as steeply as food energy needs increase, high calorie diets can approach or exceed recommended levels of nutrients. At higher food energy levels, those nutrients and food constituents targeted for moderation continue to be of concern, because high intakes may be linked with increased risk of certain chronic conditions. At higher calorie levels, the system encourages use of larger or additional servings of foods from the major groups to meet food energy needs while only moderately increasing consumption of fat and sweeteners.

In summary, following this food guidance system may result in diets that fall short of desired levels of a few nutrients at lower food energy levels and may somewhat exceed desired levels of cholesterol and sodium for some age groups at the highest food energy levels. Nevertheless, this system provides a reasonable basis for an overall improvement in the diets of most Americans.

## **USING THE FOOD GUIDANCE SYSTEM TO PLAN MENUS**

To illustrate how the food guidance system can be used, 10 days of menus were developed (Appendix II). These menus were designed for a woman about 30 years of age, whose energy need approximates the 2000 calorie midpoint of the range recommended by the Committee on Dietary Allowances for women aged 23 to 50 (20). The number of servings selected from each food group approximates the number used for example B. (As noted previously, examples A through D were developed for illustrative purposes only. It is expected that individuals will select a number of servings from within the ranges of servings suggested for each group in Table 2. The number of servings selected from each group may vary from day to day.)

The 10 menus were designed to illustrate flexibility in selecting a wide variety of foods within each food group and flexibility in selecting specific food sources of "added fat" and "added sweetener." The menus also illustrate principles of balancing food choices that are higher and lower in fat, sweeteners, and sodium to achieve overall moderation of these food constituents in the diet. These menus were not planned to be used on consecutive days. That is, no effort was made to incorporate leftovers in later meals or to use a particular type of milk, margarine, or salad dressing consistently. Instead, efforts were made to use a wide variety of items to show how many kinds of foods and styles of eating can fit this food guidance system.



Table 17 lists the nutrient levels in the 10 menus as percentages of the RDA for a woman 23 to 50, the percentages of calories from protein, total fat, total carbohydrates, and sweeteners, and the amount of food energy, sodium, potassium, and cholesterol in each menu. The mean levels for the 10 menus are also shown. Each of the menus provides 95 percent or more of the RDA for protein, calcium, phosphorus, vitamin A, thiamin, riboflavin, niacin, and vitamins B<sub>12</sub> and C. All but one menu provides 95 percent or more of the RDA for magnesium. The mean over the 10 days for each of these nutrients is greater than the RDA. Five of the individual menus fail to provide the RDA for vitamin B<sub>6</sub>; however, the menus do provide an average of 0.02 mg of vitamin B<sub>6</sub> per gram of protein.

The mean percentages of the RDA for three nutrients--iron, zinc and folacin--are 82 percent, 89 percent, and 78 percent, respectively (Table 17). These are three of the "problem nutrients" identified previously. Menu 1 provides more than the RDA for zinc, Menu 7 provides more than the RDA for zinc, iron, and folacin, and Menu 8 provides more than the RDA for zinc and iron. This demonstrates that individual menus can be planned to provide the RDA by selecting individual foods that are good sources of those nutrients. For example, both Menus 7 and 8 include beef and pork, a serving of dried beans and peas, and the equivalent of eight or more servings of bread and cereal products, including two to three servings that are whole-grain products. While these foods are all particularly good sources of iron or zinc, they may not be as good sources of other essential nutrients as other foods in their group. For example, dried beans and peas are good sources of iron and zinc but contain little or no vitamin C.

The range in percentage of RDA in Table 17 also illustrates the variation in nutrient levels from menu to menu. Some nutrients are subject to more variation than others. These are generally nutrients for which certain specific types of foods within a group are significantly better sources than others. Vitamin C is an excellent example. Citrus fruits, berries, melons, dark-green leafy vegetables, and members of the cabbage family tend to be far better sources of vitamin C than most other fruits and vegetables. Days in which several of these are chosen (Menu 1 and Menu 6) provide substantially more vitamin C than a day on which none are chosen (Menu 9).

The 10 menus provide a mean of 2000 calories and range from 1850 to 2110 calories (Table 17). The percentages of calories from fat and carbohydrates range from 25 to 34 percent and 43 to 60 percent, respectively. It is of interest to compare menus with a lower percentage of calories from fat to those with a higher percentage. Menus 8 and 9 are examples of menus

that are relatively low in fat. Although these menus have one or two foods that could be considered high-fat foods (hot dog, swiss cheese, and peanut butter) they contain relatively few servings of butter, margarine, or salad dressing and no dessert items such as cake or cookies, so the total fat is modest. Menus 3 and 4 are examples of menus that are relatively high in fat by comparison. These menus include more choices that are higher in fat such as quick breads (pancakes, biscuits), cookies, cheese, sausage, and more or larger servings of butter, margarine, and salad dressing.

While both menus are moderate in fat and contain less fat as a percentage of calories than most women reported on the 1977-78 NFCS (33), they illustrate the importance of balancing choices. Foods such as peanut butter, hot dogs, sausage, whole milk, and cheese can be used in a diet moderate in fat if other choices are lower in fat or the number and size of portions of fats and oils--such as butter, margarine, and salad dressing--are limited.

Other techniques described in "Better Eating for Better Health" to moderate fat were also used in developing these menus. All meat was trimmed of visible fat, poultry skin was removed, and lean hamburger and water-pack tuna were selected. All meat and poultry items were roasted or broiled, and fat drippings were not served. Some of the menu items were made using recipes that had been modified to reduce fat, sweeteners, and sodium. The sources of these recipes are noted. Amounts of salad dressings and butter or margarine included in the menus were also limited.

The menus demonstrate that items such as cake, cookies, ice cream, candy bars, soft drinks, and alcoholic beverages can be part of a diet that provides substantially more nutrients and less fat and sweeteners than are reported on surveys. It is a matter of frequency of selection and amount consumed. Some of these items are presented in the course as "trade-offs," to illustrate that many dessert and snack items are sources of protein, vitamins, and minerals found in grains and milk, but contain significantly more fat or added sweeteners than enriched bread or skim milk. The menus show how the "trade-offs" can work in planning menus. As an example, Menu 6 includes both cake and cookies, and therefore contains fewer servings of items from the grains, breads, and cereals group. In this menu, the enriched flour in the cake and the cookies provides amounts of nutrients approximately equivalent to several servings of enriched bread. The fat in these items is balanced by using relatively fewer servings of concentrated sources of fat, such as margarine and salad dressing. Other menus provide other illustrations.



All of the menus are within the "safe and adequate" sodium range (20) for adults (Table 17), but the amount of sodium varies. The estimate of sodium content for each menu includes all naturally occurring sodium, sodium added in processing, and sodium in foods prepared from recipes. Sodium that could be added in the home preparation of cooked cereals, pasta, or meat is not included, nor is sodium that could be added at the table. The menus contain an average of 2140 mg of sodium and range from 1580 to 2610 mg. The menus illustrate that foods relatively high in sodium such as cured or processed meats, cheese, canned vegetables, and condiments such as soy sauce (Beef with Chinese Vegetables recipe) can be used in menus as long as a number of lower sodium choices are also included. The relatively high-sodium lunch in Menu 10 is balanced with a relatively low-sodium dinner. The Chicken Curry recipe has been modified to reduce the sodium content.

The 10 menus provide an average of 335 mg of cholesterol with a range of 185 to 490 mg (Table 17). The amount of cholesterol is primarily related to the use of eggs as separate items or as an ingredient in other foods. It is also related to the use of higher fat dairy products and higher fat dairy fats. A large amount of cholesterol in the diet one day can be balanced with amounts of cholesterol that are quite low on other days. The menus illustrate this principle.

A major objective for usability of this food guidance system was flexibility to accommodate the energy and nutrient needs of individuals of different ages and sexes and with different levels of physical activity. Individuals could choose an appropriate number of servings from the ranges suggested for major food groups, along with moderate amounts of fat and sweeteners. Differing nutrient and food energy needs can be met by selecting larger servings or additional servings of items served or available to an entire family or other group.

Menu 1 from the set of 10 menus was adapted for a 4-year-old child, a 16-year-old teenage boy, a 30-year-old woman, a 40-year-old man, and a 60-year-old woman (Table 18). The food energy needs defined for the individuals are 1400 (4-year-old child), 3000 (16-year-old boy), 2000 (30-year-old woman), 2400 (40-year-old man), and 1550 (60-year-old woman). The menu was adapted by adjusting portions and by including some extra foods that require little or no preparation (Table 18). For example, servings for the 4-year-old child were generally one-half to three-fourths the size of those for the rest of the family, and snacks were included between meals. To meet the food energy and nutrient needs of the man and the teenage boy, larger servings or additional servings were provided. The man has a glass of wine as a "snack," while the teenage boy



has a peanut butter and jelly sandwich and a large glass of fruit punch.

Table 19 shows nutrient levels provided by the adapted menu as percentages of the RDA and protein, fat, carbohydrate, and added sweeteners as percentages of calories. This menu--as adapted--provides the RDA for all nutrients for the teenage and adult males. For others it provides the RDA for most nutrients. The exceptions are iron for the 4-year-old child, iron for the younger woman, and zinc and folacin for the older woman. Levels of these nutrients exceed 80 percent of the RDA. Each of the adapted menus contains 30 percent or less of calories from fat. The amount of added sweeteners varies. The young child and teenage boy have 11 percent of calories from sweeteners, while the adults have 5 percent. Menus for the younger woman and the man include an alcoholic beverage, which accounts for 3 to 4 percent of calories. In order to maximize nutrients for the older woman with lower food energy needs, the amount of added sweeteners included is less than that included for others, and no alcoholic beverage is included.

This section illustrates some ways the food guidance system can be used to plan menus that include a variety of popular food items and that also meet our established objectives for nutrient adequacy and moderation. One menu was adapted for several individuals differing by sex, age, and level of physical activity to show how the system can be used for a family. The food guidance system is based on food groups patterned after food groups used previously and presents the kinds of foods most Americans eat. Thus the guidance system meets the usability objectives established for its design.

The food guidance system as presented in "Better Eating for Better Health" has been field tested and found to be effective in helping course participants learn and apply nutrition concepts of variety, moderation, and balance to their own diets (19).

## NOTES

Note 1: Unpublished data on folacin in the United States food supply from the Human Nutrition Information Service, U.S. Department of Agriculture, 1984.

Note 2: Data from "Eating Behavior and Associated Nutrient Quality of Diets, Final Report" by A. F. Crocetti and H. A. Guthrie, Anarex Systems Research Corporation, New York, NY, 1982, for Human Nutrition Center, Science and Education Administration, U.S. Department of Agriculture.

Note 3: Data from Nationwide Food Consumption Survey, 1977. Data are summarized in Preliminary Report No. 2, "Food and Nutrient Intakes of Individuals in 1 Day in the United States, Spring 1977." Human Nutrition Information Service, U.S. Department of Agriculture, 1977.

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## **APPENDIX I: THE FOOD WHEEL AND A DAY'S WORTH OF FOOD AND NUTRIENTS**

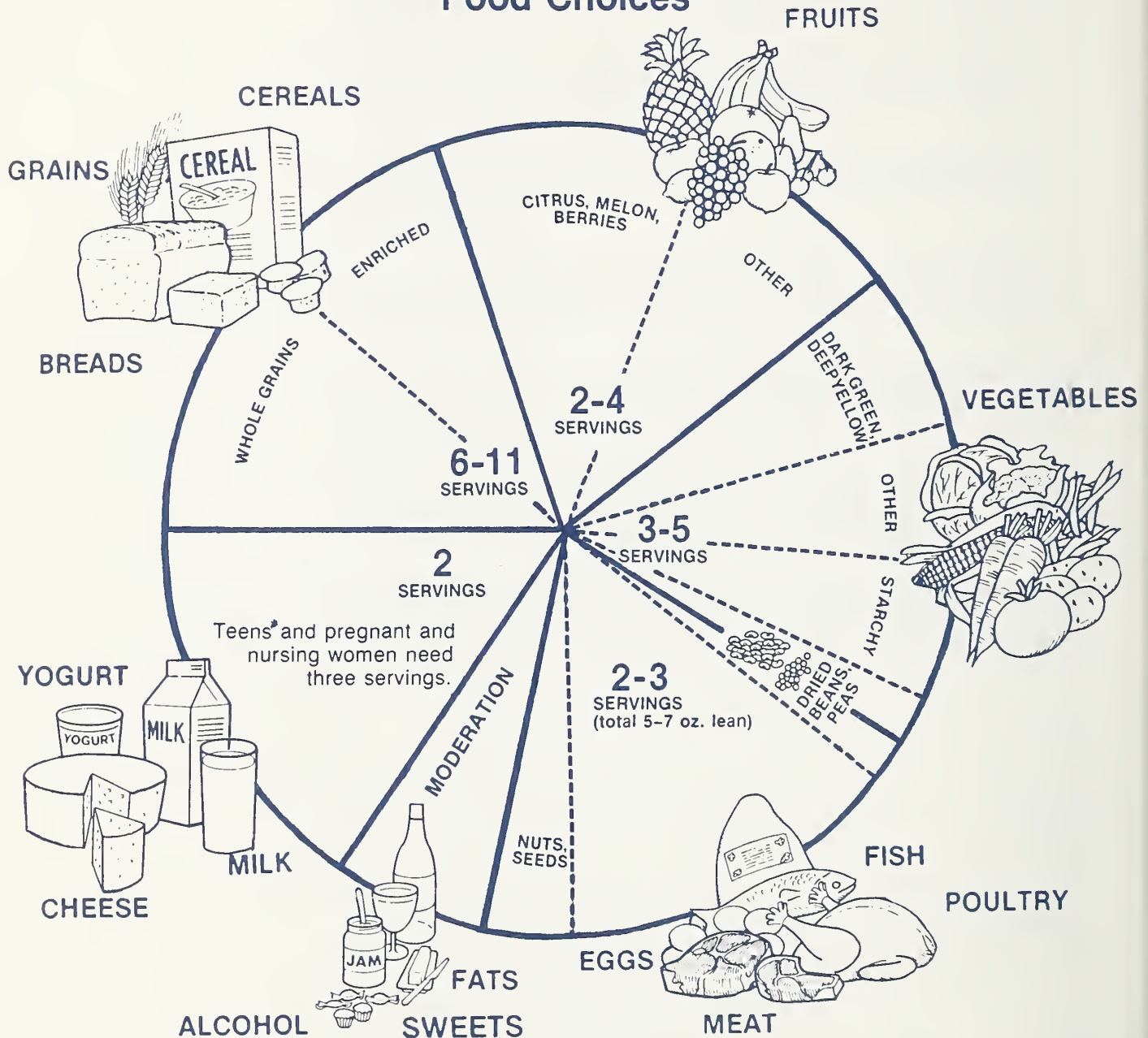
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Reproduced from Participant's Guide, "Better Eating for Better Health," American National Red Cross, 1984.

American Red Cross

# FOOD WHEEL

A Pattern for Daily Food Choices



\*Teens under 19 who are pregnant or nursing need 4 servings a day.

This Food Wheel groups foods by the nutrients they provide. It is important not only to choose foods from each group every day but also to vary choices within each group.

Everyone should try to have at least the number of servings at the bottom of the range, but nutritional needs vary depending on age, sex, body build, and physical activity. Older children, teens, and most women (especially pregnant and nursing women) and

men need more servings to meet their nutrient and energy needs. Young children may have smaller servings from the groups, except that they should have the equivalent of two cups of milk a day.

The Food Wheel was developed for most healthy people in the United States. Use it along with the other materials in the Red Cross nutrition course, **Better Eating for Better Health**.

## A Day's Worth of Food and Nutrients



We can combine foods in a number of ways to meet nutrient recommendations. The Food Wheel shows one way people can choose from foods that are available in the United States to get the nutrients they need.

The Food Wheel groups foods by the nutrients they provide. Food groups are not interchangeable. Each food group contributes significant amounts of specific nutrients to the diet. Within each group, individual foods vary in the specific kind and amount of nutrients they provide. For that reason, it is important not only to choose foods from each group each day but also to vary choices within each group.

The following pages list groups of foods from the Food Wheel. They tell what is counted as a serving of each group and how many servings to have in a day. The size and number of servings can differ from those suggested; it's the amount of food that counts. That is, menus using the amount of food in the suggested servings from each group and subgroup will provide a diet that generally meets or exceeds the recommended levels of most vitamins and minerals for healthy people.

Most of the groups on the Food Wheel show a range in the number of servings recommended. Everyone should try to have daily at least the number of servings specified as the bottom of the range. Most people will need additional food. The additional amount needed depends on factors such as their age, sex, physical condition, and physical activity. These people can select more or larger servings from the food groups with ranges. As more servings are added from these food groups, the level of nutrients in the

diet is increased. Teen-agers and pregnant and nursing women need to include a third serving from the milk, yogurt, and cheese group to meet their higher calcium needs. (Teen-agers under 19 who are pregnant or nursing need four servings of milk a day.)

A good diet is moderate in fats, sweets, and alcohol. Fats and sugars and other sweeteners can be in the foods themselves or added in preparation or at the table. The examples of individual foods listed under each food group or subgroup are generally plain without added fat or sugars and sweeteners. The term "sugar" in this course means sugars and other caloric sweeteners, not just granulated sugars alone. To help you judge approximate amounts of fat or added sugar in common food items from each group, trade-offs are listed. Trade-offs are also shown for popular desserts and snacks. These foods are made from many of the same ingredients as foods in the basic groups but contain a lot more fat and sugar.

In the trade-offs, amounts of nutrients in the food items as well as approximate amounts of fat and added sugar are considered. The fat and added sugar are presented in terms of level teaspoons, rounded to the nearest whole. Since individual foods vary, the trade-offs are approximate. They are not designed to be used for special diets, but they can be used as a rough guide to sources of fat and added sugars in the foods you eat. If you want more specific information about nutrients and calories in foods, refer to publications such as *The Nutritive Value of Foods*, Home and Garden Bulletin No. 72, published by the U.S. Department of Agriculture.






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## FRUITS

Fruits contain varying amounts of nutrients. Whole raw fruits, particularly those with edible skins or seeds, are good sources of dietary fiber.

### *What Is a Serving?*

Count as a serving an average-size piece of whole fruit, a melon wedge, 6 ounces of fruit juice, a half cup of berries, a half cup of sliced or cooked fruit, or a quarter cup of dried fruit.

### *Recommended Daily Servings*

Everyone: 2-4 servings

(For young children, two kinds of fruit will give variety, but their servings can be smaller than for others.)

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### Citrus, Melon, Berries

All are excellent sources of vitamin C and provide other vitamins, such as folic acid, and minerals, such as potassium, in varying amounts.

#### Examples:

Blueberries  
Cantaloupe  
Grapefruit  
Grapefruit juice  
Honeydew melon

Lemon  
Orange  
Orange juice  
Raspberries  
Strawberries

Tangerine  
Watermelon  
Other berries, melons, and citrus fruits and juices

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### Other Fruits

Generally, other fruits contribute smaller amounts of the same nutrients that citrus fruit, melon, and berries do. Deep yellow fruits such as peaches are excellent sources of vitamin A.

#### Examples:

Apple  
Apricot  
Banana  
Cherries  
Fig

Grapes  
Nectarine  
Peach  
Pear  
Pineapple

Plum  
Prune  
Raisins  
Other fruit and fruit juices

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### Trade-offs for Fruit

$\frac{1}{2}$  cup frozen sweetened fruit =  $\frac{1}{2}$  cup of fresh or frozen unsweetened fruit + 6 teaspoons sugar

$\frac{1}{2}$  cup fruit, canned in heavy syrup =  $\frac{1}{2}$  cup unsweetened fruit + 4 teaspoons sugar

$\frac{1}{2}$  cup fruit, canned in light syrup =  $\frac{1}{2}$  cup unsweetened fruit + 2 teaspoons sugar

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## VEGETABLES

All contribute fiber and are sources of a variety of nutrients.

Choose your servings from the following groups: dark green or deep yellow vegetables, other vegetables, and starchy vegetables, including dried beans and peas. Vary your choices to include items from each subgroup of vegetables regularly. Use dark green leafy vegetables and dried beans and peas several times a week.

### *What Is a Serving?*

Count as a serving  $\frac{1}{2}$  cup cooked or cut-up vegetables or 1 cup raw leafy vegetables.

### *Recommended Daily Servings*

Everyone: 3–5 servings.

(The young child's servings can be smaller than servings for others.)

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## Dark Green or Deep Yellow Vegetables

Dark green vegetables are excellent sources of vitamins A and C, riboflavin, folic acid, iron, and magnesium. The deep yellow vegetables are excellent sources of vitamin A. Use dark green leafy vegetables several times a week.

### Examples of dark green vegetables:

Beet greens	Dandelion greens	Romaine lettuce
Broccoli	Endive	Spinach
Chard	Escarole	Turnip greens
Chicory	Kale	Watercress
Collard greens	Mustard greens	

### Examples of deep yellow vegetables:

Carrots  
Pumpkin  
Sweet potatoes  
Winter squash

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## Other Vegetables

Vegetables in this group contribute varying amounts of the vitamins and minerals found in dark green, deep yellow, or starchy vegetables. Thus, it is important to vary your choices. Brussels sprouts, cabbage, tomatoes, and green peppers are good sources of vitamin C.

### Examples of other vegetables:

Artichokes	Cauliflower	Green peppers	Summer squash
Asparagus	Celery	Lettuce	Tomatoes
Bean and alfalfa sprouts	Chinese cabbage	Mushrooms	Tomato juice
Beets	Cucumbers	Okra	Turnips
Brussels sprouts	Eggplant	Onions (mature and green)	Vegetable juices
Cabbage	Green beans	Radishes	Zucchini

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### Starchy Vegetables, Including Dried Beans and Peas

Starchy vegetables are valuable sources of starch and fiber and contribute vitamins B<sub>6</sub> and folic acid, iron, magnesium, potassium, and phosphorus. Sweet potatoes are an excellent source of vitamin A. Dried beans and peas provide many of the nutrients that meat provides and therefore can also serve as a meat alternate (see Trade-offs for Meat Alternates). Dried beans and peas are also important sources of zinc. Include dried beans and peas several times a week as a starchy vegetable.

#### Examples of starchy vegetables:

Corn	Potatoes (white)
Green peas	Rutabaga
Lima beans (baby)	Sweet potatoes

#### Examples of dried beans and peas:

Black beans	Lentils	Split peas
Black-eyed peas	Lima beans (mature)	Other types of dried beans and
Chick peas, or garbanzos	Navy beans	peas
Kidney beans	Pinto beans	

Cooking vegetables in fat or adding fat at the table increases the calories.

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### Trade-off for a Starchy Vegetable

10 French fries = 1 medium boiled potato + 2 teaspoons fat

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## MEAT, FISH, POULTRY, AND EGGS

All are good sources of protein, phosphorus, and niacin and contribute iron, zinc, and vitamins B<sub>6</sub> and B<sub>12</sub>. Meat, fish, and poultry are sources of the most absorbable form of iron. Cholesterol and vitamin B<sub>12</sub> are found only in animal products. Dried beans and peas and nuts and seeds can be used as alternates for this group. (See Trade-offs for Meat Alternates.)

### *What Is a Serving?*

Count as a serving of meat, fish, or poultry 2–4 ounces of meat or fish, trimmed of visible fat, or poultry with the skin removed. An egg can replace 1 ounce of meat.

### Examples:

Beef	Ham
Chicken	Lamb
Eggs	Organ meats such as liver
Fish	Pork

Luncheon meat, sausages, and frankfurters are generally higher in fat and calories than lean meat, fish, or poultry. However, some lean products are available and are usually so labeled. Fat and other

### *Recommended Daily Servings*

Everyone: 2–3 servings (total 5–7 ounces lean per day)

(The young child's servings of meat, fish, poultry, or eggs or an alternate can be smaller—total 3–4 ounces.)

Shellfish  
Turkey  
Veal

ingredients added in preparation can also increase the calorie content of meat, fish, and poultry items. Here are some trade-offs that illustrate this:

## Trade-offs for Meat, Fish, Poultry, and Eggs

2 ounces bologna = 1 ounce lean meat, fish, or poultry + 3 teaspoons fat

½ chicken breast, batter fried = ½ chicken breast roasted + 1 slice white bread + 2 teaspoons fat

Dried beans and peas (listed above with starchy vegetables), as well as nuts and seeds, can be used as an alternate for meat, fish, poultry, and eggs. These foods contribute protein and many of the nutrients found in lean meats, fish, poultry, and eggs. How-

ever, there are some important differences. The alternates do not contain vitamin B<sub>12</sub>. The nuts and seeds are significantly higher in fat than lean meat. Dried beans and peas contain carbohydrate, which is not found in foods in the meat group.

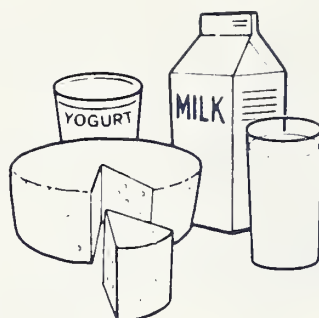
## Trade-offs for Meat Alternates

½ cup cooked dried beans or peas + 1 teaspoon fat = 1 ounce lean meat, fish, or poultry + 1 slice of bread.

2 tablespoons peanut butter = 1 ounce lean meat, fish, or poultry + 3 teaspoons fat

¼ cup seeds = 1 ounce lean meat, fish, or poultry + 4 teaspoons fat

⅓ cup nuts = 1 ounce lean meat, fish, or poultry + 5 teaspoons fat



## MILK, YOGURT, AND CHEESE

These foods are good sources of protein, calcium, riboflavin, and vitamin B<sub>12</sub> and contribute magnesium, vitamin A, thiamine, and if fortified, vitamin D.

### *What Is a Serving?*

Count as a serving 1 cup of milk. The trade-offs show the amounts of cheese or yogurt that have approximately the same amounts of vitamins and minerals as 1 cup of milk. These trade-offs also indicate the number of teaspoons of fat and/or added sugar in these products.

### *Recommended Daily Servings*

Adults: 2 servings  
 Pregnant and nursing women: 3 servings  
 Teen-agers, 11 to 18 years: 3 servings  
 Children, 10 years and under: 2 servings  
 (Young children can have the equivalent of 2 cups a day, in 3 to 4 small servings. Teen-agers under 19 who are pregnant or nursing need 4 servings a day.)

## Low-Fat Milk Products

### Examples:

Buttermilk	Low-fat yogurt, plain
Low-fat milk (1% and 2%)	Skim milk

## Other Milk Products

Whole milk and some milk products contain more fat and/or added sugar than low-fat milk products. Thus they have more calories. See the trade-offs below.

### Examples:

American cheese	Flavored yogurt	Swiss cheese
Cheddar cheese	Fruit yogurt	Whole milk
Chocolate milk	Processed cheeses	Other cheeses

## Trade-offs for Milk, Yogurt, and Cheese

1 cup whole milk = 1 cup skim milk + 2 teaspoons fat  
 1 cup 2% milk = 1 cup skim milk + 1 teaspoon fat  
 1 cup low-fat (2%) chocolate milk = 1 cup skim milk + 1 teaspoon fat + 3 teaspoons sugar  
 8 ounces plain low-fat yogurt = 1 cup skim milk + 1 teaspoon fat  
 8 ounces low-fat vanilla yogurt = 1 cup skim milk + 1 teaspoon fat + 4 teaspoons sugar  
 8 ounces low-fat fruit yogurt = 1 cup skim milk + 1 teaspoon fat + 7 teaspoons sugar  
 1½ ounces natural cheese = 1 cup skim milk + 3 teaspoons fat  
 2 ounces processed American cheese = 1 cup skim milk + 4 teaspoons fat

Cottage cheese contains less calcium than other cheeses. One-half cup of cottage cheese contains only as much calcium as found in one-quarter cup of milk, while providing considerably more calories.




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## GRAINS, BREADS, AND CEREALS

These foods contribute protein, starch, vitamins, and minerals.

### *What Is a Serving?*

Count as a serving a slice of bread; 2 large or 4 small crackers; a half cup of cooked cereal, rice, or pasta; an ounce of ready-to-eat cereal; or a small roll, muffin, or biscuit. Medium-size rolls and muffins are equal to about 1½ servings. Whole English muffins, bagels, hamburger buns, and large rolls equal about 2 servings.

### *Recommended Daily Servings*

Everyone: 6–11 servings. Include several servings of whole grain products.

(The young child's servings can be smaller than those for others.)

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### Whole Grain Products

These foods are good sources of starch and fiber and contribute protein, thiamine, riboflavin, niacin, folic acid, vitamin E, iron, phosphorus, magnesium, zinc, and other trace minerals.

#### Examples:

Brown rice  
Buckwheat groats  
Bulgur  
Graham crackers  
Granola

Oatmeal  
Pumpkin bread  
Rye crackers  
Whole wheat bread and rolls  
Whole wheat crackers

Whole wheat pasta  
Other products made with whole grain

*Note:* Products that combine whole grain flours with enriched flours have less folic acid, vitamin E, magnesium, zinc, and other trace minerals than whole grain products have but more of these nutrients than

are found in products made only with enriched flour. The type of flour listed first on the label is present in the largest amount.

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### Enriched Grain Products

In addition to containing starch and protein, these foods contain added thiamine, riboflavin, niacin, and iron. (Make sure that labels say "enriched," or indicate that these nutrients have been added.)

#### Examples:

Bagels  
Biscuits  
Corn bread  
Corn muffins  
Cornmeal  
Crackers  
English muffins  
Farina

French bread  
Grits  
Hamburger and hot dog buns  
Italian bread  
Macaroni  
Muffins  
Noodles  
Pancakes

Pasta  
Ready-to-eat cereal  
(see the label, some are fortified)  
Rice  
Other products made with enriched grains



## FATS, SWEETS, AND ALCOHOL

These foods provide mainly calories but also add palatability to the foods we eat.

*Recommended servings*

Use in moderation.



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### Fats

Fat provides more than twice as many calories per gram as protein or carbohydrates. Fats also contribute vitamin E and an essential fatty acid, linoleic acid. Vegetable oils are generally higher in polyunsaturated fatty acids than animal fats and hydrogenated vegetable fats such as margarine and shortening. The exceptions are coconut and palm oils, which are highly saturated. Individuals should vary the type of fat they choose.

Examples:

Bacon	Margarine (hard and soft)	Sour cream
Butter	Mayonnaise	Vegetable oil
Cream (dairy and nondairy)	Mayonnaise-type salad dressing	
Cream cheese	Salad dressing	

Fat content varies on a teaspoon for teaspoon basis.

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### Trade-offs for Fats

- 1 teaspoon mayonnaise = 1 teaspoon margarine, butter, or oil
- 2 teaspoons Italian salad dressing = 1 teaspoon margarine, butter, or oil
- 3 teaspoons cream cheese = 1 teaspoon margarine, butter, or oil
- 4 teaspoons light cream = 1 teaspoon margarine, butter, or oil
- 5 teaspoons sour cream = 1 teaspoon margarine, butter, or oil

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### Sweets

Sweets and sugars come in various forms.

Examples:

Candy (some contain fat)	Jam	Sherbet
Corn syrup	Jelly	Soft drinks or colas
Fruit drinks, ades	Maple syrup	Sugar (white or brown)
Frosting	Marmalade	Sugar syrup (such as in canned or frozen fruits)
Gelatin desserts	Molasses	
Honey	Ices	

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### Trade-offs for Sweets

(These trade-offs are based on approximate calorie content.)

- 1 teaspoon jam or jelly = 1 teaspoon sugar, syrup, or molasses
  - Chocolate bar, 1.05 ounces = 5 teaspoons sugar + 2 teaspoons fat
  - 12 ounces non-carbonated fruit drink, ade, or punch = 12 teaspoons sugar
  - 12 ounces cola = 9 teaspoons sugar
-

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## Alcohol

Alcohol provides 7 calories per gram, which is almost twice as many calories per gram as protein or carbohydrates (4 calories per gram), and almost as many as fat (9 calories per gram). Alcoholic drinks vary in their caloric content. Below are examples of some common drinks and the calories they provide. These beverages provide few nutrients.

12 ounces beer = 150 calories

3½ ounces table wine = 85 calories

3½ ounces dessert wine = 140 calories

1½ ounces gin, vodka, rum, whiskey = 105 calories

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## Milk- and Grain-Based Desserts and Snacks

These foods are difficult to classify because they are combinations of milk or grain plus added fat and sugar. These foods provide the same nutrients as other milk or grain products, but you obtain a small proportion of nutrients for the number of calories eaten.

The following are a few examples that illustrate the approximate amount of added sugar and fat in some common items.

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## Trade-offs for Desserts and Snack Foods

½ cup ice cream = ⅓ cup skim milk + 2 teaspoons fat + 3 teaspoons sugar

½ cup ice milk = ⅓ cup skim milk + 1 teaspoon fat + 3 teaspoons sugar

½ cup low-fat frozen yogurt = ⅓ cup skim milk + 4 teaspoons sugar

⅙ of a white layer cake with chocolate frosting = 1 slice bread + 6 teaspoons sugar + 3 teaspoons fat

2 oatmeal cookies = 1 slice bread + 1 teaspoon sugar + 1 teaspoon fat

⅙ of 9" apple pie = 2 slices bread + ⅓ medium apple + 6 teaspoons sugar + 3 teaspoons fat

18 potato chips = 1 medium boiled potato + 3 teaspoons fat

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## APPENDIX II: TEN DAILY MENUS



## MENU 1

Breakfast	Orange juice (frozen, unsweetened).....	3/4 cup
	Oatmeal.....	1 cup
	with sugar.....	2 tsp
	Milk (1% low-fat).....	1 cup
Bag lunch <sup>1</sup>	Chicken sandwich:	
	Sliced chicken (without skin).....	2 oz
	Lettuce.....	1 leaf
	Mayonnaise-type salad dressing.....	2 tsp
	Whole-wheat bread.....	2 slices
	Bean salad <sup>2</sup> .....	3/4 cup
	Chocolate chip cookies.....	2 average
	Banana (fresh).....	1 medium
	Coffee, tea, or water.....	as desired
Dinner	Roast beef (round, lean only).....	4 oz
	Rice (enriched).....	1/2 cup
	Broccoli (fresh or frozen).....	3/4 cup
	Tomato salad:	
	Tomato (fresh, sliced).....	1 medium
	Iceburg lettuce.....	1 leaf
	Italian salad dressing.....	1 tbs
	Margarine (hard, regular).....	1 tsp
Snacks	Coffee, tea, or water.....	as desired
	White wine <sup>3</sup> .....	4 oz
	English muffin (enriched).....	1 average
	Margarine (hard, regular).....	2 tsp
	Milk (1% low-fat).....	1 cup

<sup>1</sup>For safety, bag lunches should keep hot foods hot and cold foods cold.

<sup>2</sup>Recipe in "Ideas for Better Eating: Menus and Recipes to Make Use of the Dietary Guidelines." U.S. Department of Agriculture. Washington, DC: Government Printing Office, 1981.

<sup>3</sup>The inclusion of alcoholic beverages in the menus does not mean that their use is advocated. It just illustrates that they can fit in a balanced diet if one wishes to use them.

## MENU 2

Breakfast	Shredded wheat with:.....	2 biscuits
	Sliced banana.....	1 medium
	Sugar.....	2 tsp
	Milk (skim).....	1 cup
	Coffee, tea, or water.....	as desired
Fast-food lunch	Hamburger on bun:	
	Ground beef (23% fat).....	3 oz
	Hamburger bun (enriched).....	1 medium
	Iceburg lettuce.....	2 leaves
	Tomato.....	2 slices
	Ketchup.....	1 tbsp
	Potatoes, french-fried, salted.....	1 small order
Dinner	Milk (whole).....	1 cup
	Chicken cacciatore <sup>1</sup> .....	1 serving
	Spaghetti (enriched).....	1 cup
	Zucchini (fresh).....	1/2 cup
	Italian bread (enriched).....	2 slices
	Mixed green salad:	
	Romaine lettuce.....	1/2 cup
	Spinach (fresh).....	1/2 cup
	Carrot (shredded).....	1/4 cup
	Green onion (chopped).....	1 tbsp
	Italian salad dressing.....	1 tbsp
Snacks	Butter.....	1 tsp
	Coffee, tea, or water.....	as desired
	Chocolate bar.....	1-1/4 oz
	Pears (canned, water pack).....	1/2 cup

<sup>1</sup> Recipe in "Ideas for Better Eating: Menus and Recipes to Make Use of the Dietary Guidelines." U.S. Department of Agriculture. Washington, DC: Government Printing Office, 1981.

### MENU 3

Breakfast	Strawberries (fresh).....	1/2 cup
	Scrambled egg with cheese:	
	Egg.....	1 large
	Milk (skim).....	1 tbsp
	Natural cheddar cheese.....	1 oz
	Sausage (fresh, pork).....	1 oz
	Toast (enriched).....	2 slices
	Margarine (hard, regular).....	1 tsp
	Jelly.....	2 tsp
	Coffee, tea, or water.....	as desired
Lunch	Vegetable chowder <sup>1</sup> .....	1 serving
	Chicken sandwich:	
	Chicken.....	2 oz
	Mayonnaise-type salad dressing.....	2 tsp
	Lettuce.....	1 leaf
	Whole-wheat bread.....	2 slices
	Milk (skim).....	1 cup
Dinner	Oatmeal cookies.....	2 average
	Pot roast with vegetables and gravy:	
	Beef chuck (lean only).....	3 oz
	Potatoes (oven-browned).....	1/2 cup
	Carrots (sliced).....	1/2 cup
	Gravy.....	2 tbsp
	Green beans (canned).....	1/2 cup
	Dinner roll (enriched).....	1 large
	Margarine (hard, regular).....	1 tsp
	Apple crisp <sup>1</sup> .. <sup>2</sup> .....	1 serving
	Red table wine.....	4 oz

<sup>1</sup>Recipes in "Ideas for Better Eating: Menus and Recipes to Make Use of the Dietary Guidelines." U.S. Department of Agriculture. Washington, DC: Government Printing Office, 1981.

<sup>2</sup>The inclusion of alcoholic beverages in the menus does not mean that their use is advocated. It just illustrates that they can fit in a balanced diet if one wishes to use them.



#### MENU 4

Breakfast	Orange juice (frozen).....	3/4 cup
	Whole-wheat pancakes <sup>1</sup> .....	2
	Margarine (soft, tub).....	2 tsp
	Maple syrup.....	2 tbsps
	Milk (2% low-fat).....	1 cup
Bag lunch <sup>2</sup>	Tuna salad sandwich:	
	Tuna (canned in water).....	2 oz
	Egg, boiled.....	1/4 large
	Mayonnaise-type dressing.....	2 tsp
	Bread (enriched).....	2 slices
	Carrot sticks.....	1/2 medium
	Celery sticks.....	1 stalk
	Fruit cocktail (canned, light syrup).....	1/2 cup
	Coffee, tea, or water.....	as desired
Dinner	Loin of pork (roast, lean only).....	4 oz
	Sweetpotato (baked).....	1 medium
	Collard greens (canned).....	1/2 cup
	Tossed salad:	
	Iceberg lettuce.....	3/4 cup
	Tomatoes.....	1/4 cup
	Cucumber.....	1/8 cup
	Green onions.....	2 tsp
	French salad dressing.....	2 tbsps
	Biscuit (homemade).....	1 large
	Butter.....	1 tsp
	Honey.....	2 tsp
	Coffee, tea, or water.....	as desired
Snacks	Milk (2% low-fat).....	1 cup
	Sugar cookies.....	2 average

<sup>1</sup>Recipe in "Ideas for Better Eating: Menus and Recipes to Make Use of the Dietary Guidelines." U.S. Department of Agriculture. Washington, DC: Government Printing Office, 1981.

<sup>2</sup>For safety, bag lunches should keep hot foods hot and cold foods cold.

# MENU 5

Breakfast	Grapefruit and orange segments (fresh).....	1/2 cup
	Milk (skim).....	1 cup
	Banana-nut bread <sup>1</sup> .....	2 slices
	Coffee, tea, or water.....	as desired
Lunch out	Luncheon salad:	
	Egg (boiled, sliced).....	1/2 large
	Turkey (diced).....	1 oz
	Ham (lean, diced).....	1 oz
	Natural Swiss cheese.....	1 oz
	Chick peas.....	1/4 cup
	Celery.....	1/3 cup
	Green pepper.....	1/3 cup
	Romaine lettuce.....	1/3 cup
	Spinach (fresh).....	1/3 cup
	Iceberg lettuce.....	1/3 cup
	Thousand Island salad dressing.....	2 tbsp
	Roll (enriched).....	1 large
	Butter.....	1 tsp
	Cola.....	8 fl oz
Dinner	Roast beef (round, lean only).....	3-1/2 oz
	Green beans (frozen).....	1/2 cup
	Mashed potatoes.....	1/2 cup
	Dinner roll (enriched).....	1 large
	Jelly.....	2 tsp
	Margarine (hard, regular).....	2 tsp
	Ice cream, vanilla.....	1/2 cup
	Coffee, tea, or water.....	as desired
Snacks	Apple, fresh.....	1 medium
	Graham crackers.....	2 squares

<sup>1</sup>Recipe in "Ideas for Better Eating: Menus and Recipes to Make Use of the Dietary Guidelines." U.S. Department of Agriculture. Washington, DC: Government Printing Office, 1981.

# MENU 6

Breakfast	Grapefruit juice (canned, unsweetened).....	3/4 cup
	Bran muffin.....	2 medium
	Margarine (soft, tub).....	1 tsp
	Milk (2% low-fat).....	1 cup
Lunch	Tuna-salad-stuffed tomato:	
	Tuna (canned in water).....	2 oz
	Celery (chopped).....	1 tbsps
	Mayonnaise.....	2 tsp
	Tomato.....	1 medium
	Deviled egg.....	1/2 large
	Whole-wheat crackers.....	4
	Fresh fruit cup (apple, banana, grapes, orange).....	1/2 cup
	Coffee, tea, or water.....	as desired
Dinner	Chicken, baked (skin removed).....	3-1/2 oz
	Potato (baked, with skin).....	1 average
	Sour cream.....	2 tbsps
	Broccoli (fresh or frozen).....	1/2 cup
	Dinner roll (enriched).....	1 small
	Margarine (soft, tub).....	1 tsp
	Tossed salad:	
	Iceberg lettuce.....	1 cup
	Tomato.....	1/4 cup
	Cucumber.....	1/8 cup
	Onion.....	1 tbsps
	Blue cheese salad dressing.....	1 tbsps
	White layer cake with chocolate icing.....	1 slice
	Coffee, tea, or water.....	as desired
Snacks	Coffee-flavored yogurt (low-fat).....	8 fl oz
	Chocolate chip cookies.....	2 medium



# MENU 7

Breakfast	Orange juice (fresh or frozen, unsweetened).....	3/4 cup
	Bagel.....	1 average
	Cream cheese.....	1 tbsp
	Jelly.....	2 tsp
	Milk (skim).....	1 cup
Cafeteria lunch	Pork chop (lean only).....	3 oz
	Black-eyed peas.....	1/2 cup
	Rice (enriched).....	1 cup
	Cornbread.....	1 serving
	Margarine (hard, regular).....	2 tsp
	Applesauce (canned, unsweetened).....	1/2 cup
	Coffee, tea, or water.....	as desired
Dinner	Meat loaf (beef).....	1 serving
	Noodles (enriched).....	1 cup
	Green peas (frozen).....	3/4 cup
	Carrots (fresh).....	3/4 cup
	Whole-wheat dinner roll.....	1 large
	Margarine (hard, regular).....	2 tsp
	Coffee, tea, or water.....	as desired
Snack	Chocolate milk (low-fat).....	1 cup

# MENU 8

Breakfast	Grapefruit (fresh).....	1/2 medium
	Whole-wheat cereal.....	1 cup
	cooked with brown sugar.....	2 tsp
	Milk (1% low-fat).....	1 cup
Picnic out <sup>1</sup>	Hot dog (beef and pork).....	2 oz
	Hot dog bun (enriched).....	1
	Mustard.....	1 tsp
	Baked beans (canned with tomato sauce).....	1/2 cup
	Cole slaw:	
	Cabbage (raw).....	1/2 cup
	Carrot (grated).....	2 tbsp
	Mayonnaise-type dressing.....	2 tsp
Dinner	Cola.....	8 fl oz
	Flank steak, marinated in wine.....	5 oz
	Rice (enriched).....	1 cup
	Spinach (fresh or frozen).....	1/2 cup
	Corn (canned) with green pepper (fresh).....	1/2 cup
	Dinner roll (enriched).....	1 large
	Margarine (soft, tub).....	2 tsp
	Peaches (sliced, canned in light syrup).....	1/2 cup
Snack	Coffee, tea, or water.....	as desired
	Whole-wheat crackers.....	4 medium
	Swiss cheese.....	1-1/2 oz

<sup>1</sup>For safety, hot foods should be kept hot and cold foods cold.

## MENU 9

Breakfast	Prune juice (canned, unsweetened).....	3/4 cup
	Egg (soft-cooked).....	1 large
	Toast (enriched).....	2 slices
	Margarine (soft, tub).....	2 tsp
	Milk (2% low-fat).....	1 cup
	Coffee, tea, or water.....	as desired
Bag Lunch <sup>1</sup>	Split pea soup <sup>2</sup> .....	1 serving
	Peanut butter and jelly sandwich:	
	Peanut butter.....	2 tbsp
	Jelly.....	2 tsp
	Whole-wheat bread.....	2 slices
	Carrot and celery sticks:	
	Carrot.....	1/2 medium
	Celery.....	1 stalk
Dinner	Coffee, tea, or water.....	as desired
	Beef with Chinese vegetables <sup>2</sup> .....	1 serving
	Rice (white, enriched).....	1 cup
	Apple, grape, and celery salad:	
	Apple (sliced).....	1/2 cup
	Grapes.....	1/4 cup
	Celery (chopped).....	1/4 cup
	Mayonnaise-type dressing.....	2 tsp
Snacks	Coffee, tea, or water.....	as desired
	Fruit-flavored yogurt (low-fat).....	8 fl oz
	Banana (fresh).....	1 medium
	Graham crackers.....	4 squares

<sup>1</sup>For safety, bag lunches should keep hot foods hot and cold food cold.

<sup>2</sup>Recipes in "Ideas for Better Eating: Menus and Recipes to Make Use of the Dietary Guidelines." U.S. Department of Agriculture. Washington, DC: Government Printing Office, 1981.



# MENU 10

Breakfast	Cantaloupe.....	1/4 medium
	Egg (poached).....	1 large
	Toast (enriched).....	2 slices
	Margarine (soft, tub).....	2 tsp
	Milk (1% low-fat).....	1 cup
Lunch	Vegetable chowder <sup>1</sup> .....	1 serving
	Ham and cheese sandwich:	
	Ham (lean).....	2 oz
	Natural Swiss cheese.....	1-1/2 oz
	Whole-wheat bread.....	2 slices
	Mustard.....	1 tsp
	Tangerine.....	1 medium
	Coffee, tea, or water.....	as desired
Dinner	Chicken curry <sup>2</sup> .....	1 serving
	Brown rice.....	1 cup
	Okra (fresh or frozen).....	1/2 cup
	Tossed salad:	
	Iceberg lettuce.....	1/3 cup
	Romaine lettuce.....	1/3 cup
	Tomato.....	1/4 cup
	Celery (chopped).....	1 tbs
	Italian salad dressing.....	1 tbs
	Coffee, tea, or water.....	as desired
Snacks	Chocolate chip cookies.....	2 medium
	Pineapple juice (canned, unsweetened).....	3/4 cup
	Fruit-flavored soda.....	8 fl oz

<sup>1</sup>Recipe in "Ideas for Better Eating: Menus and Recipes to Make Use of the Dietary Guidelines." U.S. Department of Agriculture. Washington, DC: Government Printing Office, 1981.

<sup>2</sup>Recipe in "Food 3." Chicago: American Dietetic Association, 1982.

## TABLES

Table 1.--Goals and objectives for the food guidance system

SUBJECT	GOAL	OBJECTIVES
Food energy	To assist individuals in selecting diets that have an appropriate amount of food energy to maintain "ideal" weight.	To develop a framework for selecting diets that span the recommended food energy ranges for most of the U.S. population--1400 to 3200 calories.
Protein, vitamins, and minerals	To assist individuals in selecting diets that meet the RDA for all nutrients without depending on contributions of supplements or of a few foods fortified with large amounts of one or more nutrients.	<p>To assure that diets continue to meet the RDA for nutrients that are generally adequate in U.S. diets--protein, thiamin, riboflavin, niacin, vitamin B<sub>12</sub>, vitamin C, and phosphorus.</p> <p>To give particular emphasis to selection of foods that are sources of "problem nutrients"--calcium, iron, magnesium, zinc, vitamins A and B<sub>6</sub>, and folacin. In particular:</p> <ul style="list-style-type: none"> <li>-- To suggest foods to meet the RDA for calcium, magnesium, and vitamin A at all food energy levels.</li> <li>-- To ensure a minimum of 0.02 mg of vitamin B<sub>6</sub> per gram of protein.</li> <li>-- To increase iron consumption substantially over currently reported intakes at the lowest food energy levels and to achieve the RDA for iron at higher food energy levels.</li> <li>-- To increase zinc consumption substantially over current reported intakes at lower food energy levels and to achieve the RDA for zinc at higher food energy levels.</li> </ul> <p>To encourage selection of a wide variety of foods to help assure adequate amounts of nutrients for which no RDA for safe and adequate ranges are set or for which insufficient food composition data are available to estimate content in diets.</p>



Table 1--continued

SUBJECT	GOAL	OBJECTIVES
Total fat	To assist individuals in moderating the levels of fat in their diets.	<p>To provide guidance that, if followed, would be expected to result in diets with 35 percent or less of food energy from fat.</p> <p>To identify sources of fat in the diet.</p> <p>To suggest ways to reduce fat used in food preparation and at the table and ways to balance foods that are high in fat with foods that are low in fat.</p>
Fatty acids	To encourage individuals to vary the types of fat in their diets.	<p>To provide information on sources of saturated and polyunsaturated fat.</p> <p>To suggest that individuals vary the types of fats they use.</p>
Complex carbohydrates	To assist individuals in selecting diets that provide adequate amounts of starch and fiber.	To increase consumption of foods high in starch and/or dietary fiber--fruits, vegetables, and breads and cereals, especially whole-grain types.
Sugars and caloric sweeteners	To assist individuals in moderating the level of sweeteners in their diets.	To provide guidance that, if followed, would be expected to result in diets with 12 percent or less of food energy from sweeteners.
Alcohol	To encourage individuals who consume alcoholic beverages to moderate their intake.	<p>To provide information on food sources of sweeteners and ways to reduce use of sweeteners in cooking.</p> <p>To provide information about the caloric content of alcohol and alcoholic beverages and about some problems related to excess consumption.</p>

Table 1--continued

SUBJECT	GOAL	OBJECTIVES
Cholesterol	To assist individuals in moderating the level of cholesterol in their diets.	To provide guidance that, if followed, would be expected to result in diets with an average of 350 mg or less cholesterol.
Sodium	To assist individuals in moderating the amount of sodium in their diets.	<p>To provide guidance that, if followed, would be expected to result in diets within the "safe and adequate" range of sodium for adults (1100 to 3300 mg).</p> <p>To provide information on sources of dietary sodium and on ways to balance selections of foods that are high in sodium with those that are low in sodium.</p> <p>To show ways to flavor foods in cooking or at the table using little or no salt or other condiments that are high in sodium.</p>
Usability	To be understood, remembered, and effectively used by the intended audience.	<p>To design a food guidance system using food groups as an organizing framework for the nutrition information presented and--as far as possible--to pattern food groups after those previously used.</p> <p>To present the kinds of foods that most Americans eat, in various forms and styles of preparation, and to illustrate the nutritional contributions that these foods make to diets.</p> <p>To allow maximum flexibility in selecting foods to meet nutrient needs at appropriate food energy levels while avoiding too much fat, sweeteners, or sodium.</p> <p>To develop a framework for food choices that allows individuals differing by sex, age, and level of activity to meet their nutrient and energy needs by choosing different amounts of foods from the same menu.</p>

Table 2.--Food groups and subgroups and recommended servings

FOOD GROUP	RECOMMENDED DAILY SERVINGS	SERVING SIZE
<u>Fruits</u>	Two to four.	An average piece of whole fruit, a melon wedge, 6 oz fruit juice, 1/2 cup berries or sliced or cooked fruit, 1/4 cup dried fruit
<ul style="list-style-type: none"> <li>• Citrus, melon, berries</li> <li>• Other fruits</li> </ul>		
<u>Vegetables</u>	Three to five. Include servings of dark-green leafy vegetables and of dried beans and peas several times a week	1/2 cup cooked or raw, except 1 cup of raw leafy vegetables
<ul style="list-style-type: none"> <li>• Dark-green and deep-yellow</li> <li>• Starchy, including dried beans and peas</li> <li>• Other vegetables</li> </ul>		
<u>Meat, Fish, Poultry, and Eggs</u>	Two to three. A total of 5 to 7 oz lean daily	
<u>Milk, Yogurt, and Cheese</u>	Two; three servings for teenagers and pregnant or nursing women; four servings for pregnant or nursing teenagers.	1 cup milk, 8 oz yogurt, 1-1/2 oz natural cheese, 2 oz processed cheese.
<u>Grains, Breads, and Cereals</u>	Six to eleven. Include several servings of whole-grain products daily	1 slice of bread, 2 large or 4 small crackers, 1/2 cup cooked cereal, rice, or pasta; 1 oz ready-to-eat cereal, 1 small roll, muffin, or biscuit; a medium-size roll or muffin is equal to about 1-1/2 servings; a whole English muffin, bagel, hamburger bun, or large roll is equal to 2 servings.
<ul style="list-style-type: none"> <li>• Whole-grain</li> <li>• Enriched</li> </ul>		
<u>Fats, Sweets, Alcohol</u>	Fats and sweets in moderation; alcohol, none or in moderation.	

NOTE: Smaller servings sizes are recommended for many young children for all food groups except the milk group; the equivalent of two servings per day from this group is recommended.



Table 3.--Examples for assessing nutrient adequacy<sup>1</sup>

Food group	Example			
	A	B	C	D
-----Servings per day-----				
Fruits	2	2	3	4
Vegetables <sup>2</sup>	3	4	4	5
Meat, Fish, Poultry, Eggs <sup>3</sup>	5 oz	6 oz	7 oz	7 oz
Milk, Yogurt, Cheese	2	2	2	2
Grains, Breads, and Cereals <sup>4</sup>	6	8	9	11

<sup>1</sup>Examples A1, B1, C1 and D1, not shown here, are examples A, B, C and D adjusted to include 3 servings from the milk group for teenagers and pregnant and lactating women. Example A2, not shown here, is Example A adjusted for young children by reducing the size of servings from each of the food groups by one-third, except for the milk group.

<sup>2</sup>Servings of vegetables are obtained equally from each of the subgroups--dark green/deep-yellow, starchy, and other vegetables. The dark-green/deep-yellow serving consists of three-sevenths of a serving of dark green and four-sevenths of a serving of deep-yellow vegetables. The starchy vegetable serving consists of three-sevenths of a serving of dried peas and beans and four-sevenths of a serving of other starchy vegetables.

<sup>3</sup>Because the serving size of types and cuts of meats can vary markedly, a total number of ounces of lean meat is specified. Each example includes one-half egg.

<sup>4</sup>Each example includes 3 servings of whole-grain products.

Table 4.--Nutritive value of one serving of food for each food group or subgroup

Food <sup>1</sup>	Amount <sup>1</sup>	Food energy	Protein	Fat	Carbohydrate	Calcium	Iron	Magnesium	Phosphorus	Zinc	Vitamin A value
		kcal	g	g	g	mg	mg	mg	mg	mg	IU
Fruits	1 serving	70	0.9	0.3	17.6	16	0.3	16	19	0.12	301
Vegetables:											
- Dark-green	1 serving	20	2.3	0.3	3.3	97	1.7	31	37	0.39	4649
- Deep-yellow	1 serving	40	0.9	0.2	9.2	24	0.4	14	28	0.22	7234
- Dried beans and peas	1 serving	109	7.0	0.5	19.6	42	3.2	48	134	0.94	2
- Other starchy	1 serving	65	2.1	0.2	14.0	7	0.4	17	52	0.33	82
- Other	1 serving	14	0.8	0.2	3.0	15	0.4	9	19	0.20	315
Meat, Fish, Poultry	3 oz <sup>2</sup>	182	24.1	8.7	0.2	13	1.9	22	194	3.44	778
Egg	1 large	79	6.1	5.6	0.6	28	1.0	6	90	0.72	260
Milk, skim <sup>3</sup>	1 cup	86	8.4	0.4	11.9	302	0.1	28	247	0.98	307
Grain, Breads, and Cereals: <sup>4</sup>											
Whole-grain products	1 serving	76	2.6	1.2	14.8	17	0.9	26	75	0.55	3
Enriched grain products	1 serving	87	2.3	1.2	16.4	25	0.8	7	31	0.26	8

Food <sup>1</sup>	Amount <sup>1</sup>	Thiamin	Riboflavin	Pre-formed Niacin	Vitamin B <sub>6</sub>	Vitamin B <sub>12</sub>	Ascorbic acid	Folic acid	Cholesterol	Sodium	Potassium
		mg	mg	mg	mg	µg	mg	µg	mg	mg	mg
Fruits	1 serving	0.08	0.05	0.4	0.15	0.00	33	26	0	4	258
Vegetables:											
- Dark-green	1 serving	0.07	0.14	0.5	0.18	0.00	46	56	0	51	237
- Deep-yellow	1 serving	0.04	0.05	0.4	0.12	0.00	7	17	0	35	98
- Dried beans and peas	1 serving	0.12	0.06	0.7	0.14	0.00	0	36	0	43	351
- Other starchy	1 serving	0.08	0.04	1.2	0.19	0.00	12	18	0	44	299
- Other	1 serving	0.04	0.04	0.3	0.06	0.00	11	24	0	60	137
Meat, Fish, Poultry	3 oz <sup>2</sup>	0.14	0.25	5.6	0.31	2.07	1	8	82	116	295
Egg	1 large	0.04	0.15	0.0	0.06	0.77	0	32	274	69	65
Milk, skim <sup>3</sup>	1 cup	0.09	0.34	0.2	0.10	0.93	2	13	4	126	406
Grains, Breads, and Cereals: <sup>4</sup>											
Whole-grain products	1 serving	0.09	0.07	1.1	0.05	0.00	0	12	1	103	68
Enriched grain products	1 serving	0.11	0.07	1.2	0.02	0.00	0	8	4	106	33

<sup>1</sup>Foods contained in each food group or subgroup are listed in Appendix I. Serving sizes are defined in table 2. Development of the composites is described on page 21.

<sup>2</sup>Serving size for the meat, fish, and poultry was not specified in the food guidance system; rather 5 to 7 oz total lean per day is recommended because serving sizes vary widely; 3 oz was an arbitrary selection.

<sup>3</sup>Skim milk values shown are used to represent milk products with minimum fat content. Values are for skim milk no solids added and with vitamin A value at levels for whole milk. People selecting skim milk only might have higher values for some nutrients than shown.

<sup>4</sup>Grain, bread, and cereal values shown do not include nutrients added to fortified ready-to-eat cereals. People who select fortified cereals will have higher values for some nutrients than shown.

Table 5--Example A<sup>1</sup>: Nutrient levels and percentages of Recommended Dietary Allowances (RDA) for specified sex-age groups

Nutrient <sup>2</sup>	Nutrient level	Child		Female		
		4-6 yr	7-10 yr	19-22 yr	23-50 yr	51+ yr
-----Percent of RDA-----						
Protein	79 g	264	233	180	180	180
Calcium	890 mg	111	111	111	111	111
Iron	12.2 mg	122	122	68	68	122
Magnesium	285 mg	142	114	95	95	95
Phosphorus	1320 mg	166	166	166	166	166
Zinc	11.3 mg	113	113	75	75	75
Vitamin A value	9034 IU	361	258	226	226	226
Thiamin	1.4 mg	150	113	123	135	135
Riboflavin	1.8 mg	182	130	140	152	152
Preformed niacin <sup>3</sup>	18 mg	166	114	131	141	141
Vitamin B <sub>6</sub> <sup>4</sup>	1.6 mg	122	99	79	79	79
Vitamin B <sub>12</sub>	5.3 µg	212	177	177	177	177
Ascorbic acid	115 mg	251	251	188	188	188
Folacin	245 µg	123	82	61	61	61

<sup>1</sup>Includes servings as follows: 2 fruit; 3 vegetable; 5 oz meat, fish, poultry, eggs; 2 milk; 6 bread and cereal.

<sup>2</sup>The Committee on Dietary Allowances recommends that a "safe and adequate" range for potassium for adults is 1875 to 5625 mg. Example A provides 2720 mg, which falls within this range.

<sup>3</sup>Only preformed niacin and not niacin from tryptophan was included in the nutrient analysis; thus, the values for the percent of RDA for niacin are lower than what is actually provided by Example A.

<sup>4</sup>The standard of 0.02 mg of vitamin B<sub>6</sub> per gram of protein is met by Example A.



Table 6--EXAMPLE B<sup>1</sup>: Nutrient levels and percentages of Recommended Dietary Allowances (RDA) for specified sex-age groups

Nutrient <sup>2</sup>	Nutrient level	Child			Female			Male
		4-6 yr	7-10 yr	19-22 yr	23-50 yr	51+ yr	51+ yr	
-----Percent of RDA-----								
Protein	94 g	313	276	213	213	213	168	
Calcium	970 mg	122	122	122	122	122	122	
Iron	15.4 mg	154	154	86	86	154	154	
Magnesium	325 mg	163	130	108	108	108	93	
Phosphorus	1500 mg	187	187	187	187	187	187	
Zinc	13.3 mg	133	133	88	88	88	88	
Vitamin A value	11454 IU	458	327	286	286	286	229	
Thiamin	1.7 mg	187	140	153	168	168	140	
Riboflavin	2.1 mg	210	150	162	175	175	150	
Preformed niacin <sup>3</sup>	23 mg	210	145	165	178	178	145	
Vitamin B <sub>6</sub> <sup>4</sup>	1.8 mg	142	116	93	93	93	84	
Vitamin B <sub>12</sub>	6.0 µg	240	200	200	200	200	200	
Ascorbic acid	127 mg	282	282	211	211	211	211	
Folacin	290 µg	146	97	73	73	73	73	

<sup>1</sup>Includes servings as follows: 2 fruit; 4 vegetable; 6 oz meat, fish, poultry, eggs; 2 milk; 8 bread and cereal.

<sup>2</sup>The Committee on Dietary Allowances recommends that a "safe and adequate" range for potassium for adults is 1875 to 5625 mg. Example B provides 3090 mg, which falls within this range.

<sup>3</sup>Only preformed niacin and not niacin from tryptophan was included in the nutrient analysis; thus, the values for the percent of RDA for niacin are lower than what is actually provided by Example B.

<sup>4</sup>The standard of 0.02 mg of vitamin B<sub>6</sub> per gram of protein is met by Example B.

Table 7--Example C<sup>1</sup>: Nutrient levels and percentages of Recommended Dietary Allowances (RDA) for specified sex-age groups

Nutrient <sup>2</sup>	Nutrient level	Child	Female		Male			
		7-10 yr	19-22 yr	23-50 yr	51+ yr	19-22 yr	23-50 yr	51+ yr
-----Percent of RDA-----								
Protein	105 g	309	239	239	239	188	188	188
Calcium	1020 mg	127	127	127	127	127	127	127
Iron	17.1 mg	171	95	95	171	171	171	171
Magnesium	355 mg	142	118	118	118	102	102	102
Phosphorus	1610 mg	201	201	201	201	201	201	201
Zinc	14.8 mg	148	99	99	99	99	99	99
Vitamin A value	12,014 IU	343	300	300	300	240	240	240
Thiamin	1.9 mg	160	174	192	192	128	137	160
Riboflavin	2.3 mg	164	177	192	192	135	144	164
Preformed niacin <sup>3</sup>	27 mg	166	190	204	204	140	148	166
Vitamin B <sub>6</sub> <sup>4</sup>	2.1 mg	133	106	106	106	97	97	97
Vitamin B <sub>12</sub>	6.7 µg	223	223	223	223	223	223	223
Ascorbic acid	160 mg	356	267	267	267	267	267	267
Folacin	330 µg	109	82	82	82	82	82	82

<sup>1</sup>Includes servings as follows: 3 fruit; 4 vegetable; 7 oz meat, fish, poultry, eggs; 2 milk; 9 bread and cereal.

<sup>2</sup>The Committee on Dietary Allowances recommends that a "safe and adequate" range for potassium for adults is 1875 to 5625 mg. Example C provides 3880 mg, which falls within this range.

<sup>3</sup>Only preformed niacin and not niacin from tryptophan was included in the nutrient analysis; thus the values for the percent of RDA for niacin are lower than what is actually provided by Example C.

<sup>4</sup>The standard of 0.02 mg of vitamin B<sub>6</sub> per gram of protein is met by Example C.

Table 8--Example D<sup>1</sup>: Nutrient levels and percentages of Recommended Dietary Allowances (RDA) for specified sex-age groups

Nutrient <sup>2</sup>	Nutrient level	Child		Male	
		7-10 yr	19-22 yr	23-50 yr	51+ yr
-----Percent of RDA-----					
Protein	113 g	332	201	201	201
Calcium	1120 mg	139	139	139	139
Iron	20.0 mg	200	200	200	200
Magnesium	405 mg	162	116	116	116
Phosphorus	1740 mg	217	217	217	217
Zinc	15.8 mg	158	105	105	105
Vitamin A value	14,534 IU	415	291	291	291
Thiamin	2.3 mg	190	152	163	190
Riboflavin	2.6 mg	182	150	160	182
Preformed niacin <sup>3</sup>	30 mg	187	158	166	187
Vitamin B <sub>6</sub> <sup>4</sup>	2.4 mg	153	111	111	111
Vitamin B <sub>12</sub>	6.7 µg	223	223	223	223
Ascorbic acid	207 mg	461	346	346	346
Folacin	400 µg	133	100	100	100

<sup>1</sup>Includes servings as follows: 4 fruit; 5 vegetable; 7 oz meat, fish, poultry, eggs; 2 milk; 11 bread and cereal.

<sup>2</sup>The Committee on Dietary Allowances recommends that a "safe and adequate" range for potassium for adults is 1875 to 5625 mg. Example D provides 4010 mg, which falls within this range.

<sup>3</sup>Only preformed niacin and not niacin from tryptophan was included in the nutrient analysis; thus, the values for the percent of RDA for niacin are lower than what is actually provided by Example D.

<sup>4</sup>The of 0.02 mg of vitamin B<sub>6</sub> per gram of protein is met by Example D.



Table 9.--Examples A2, A1, B1, C1 and D1<sup>1</sup>: Percentages of Recommended Dietary Allowances (RDA) for specified sex-age groups

Nutrient	Example A2		Example A1		Example B1		Example C1		Example D1	
	Child 1-3 yr.	Child 4-6 yr.	Female 11-14 yr.	Female 11-14 yr.	Female 23-50 yr.	Female 23-50 preg.	Female 23-50 lact.	Male 15-18 yr.	Male 15-18 yr.	Male 15-18 yr.
-----Percent of RDA-----										
Protein	254	195	190	222	138	153	177	203	216	
Calcium	99	99	99	106	106	110	110	110	118	
Iron	55 <sup>2</sup>	82	68	86	(3)	(3)	(3)	96	112	
Magnesium	139	104	104	118	78	85	85	96	109	
Phosphorus	131	131	131	145	145	155	155	155	165	
Zinc	82	82	82	95	71	79	63	105	112	
Vitamin A	312	250	234	294	235	246	205	247	297	
Thiamin	137	107	131	161	126	143	134	143	169	
Riboflavin	180	144	166	188	163	176	155	155	170	
Preformed <sup>4</sup> niacin	137	112	123	156	156	178	149	149	168	
Vitamin B <sub>6</sub> <sup>5</sup>	125	86	94	109	75	86	89	111	127	
Vitamin B <sub>12</sub>	208	166	208	231	173	189	189	252	254	
Ascorbic acid	170	170	230	258	161	203	162	270	349	
Folacin	173	86	66	76	38 <sup>6</sup>	43 <sup>6</sup>	68	85	103	

<sup>1</sup>Examples A1, B1, C1, and D1 are the same as Examples A, B, C, and D, respectively (see table 3) except that they contain one additional cup of skim milk to meet the higher calcium needs of teens and pregnant and nursing women. Example A2 contains the foods in Example A reduced by one-third in serving size, with the exception of milk which remains at 2 cups.

<sup>2</sup>It is very difficult to meet the RDA for iron for 1 to 3 year olds (32). The use of an iron supplement or iron-fortified cereal for this age group is discussed in "Better Eating for Better Health."

<sup>3</sup>A supplement of 30 to 60 mg of iron per day is recommended for pregnant and lactating women (20).

<sup>4</sup>Only preformed niacin and not niacin from tryptophan was included in the nutrient analysis; thus, the values for the percent of RDA for niacin are lower than what is actually provided in the examples shown.

<sup>5</sup>Using the standard of 0.02 mg of vitamin B<sub>6</sub> per gram of protein, 95 percent or more of the standard is provided by the various examples shown.

<sup>6</sup>The RDA text states that "oral supplementation [of folacin] appears desirable to maintain maternal stores and keep pace with the increased folacin turnover that is seen in rapidly growing tissue" (20).

Table 10.--Composition of one teaspoon of composites of added fat and added sweeteners<sup>1</sup>

Food Constituents	Added fat <sup>2</sup>	Added sweeteners
Food energy (kcal)	37	18
Protein (g)	0.0	0.0
Fat (g)	4.2	0.0
Saturated fatty acids (g)	1.5	0.0
Monounsaturated fatty acids (g)	1.4	0.0
Polyunsaturated fatty acids (g)	1.2	0.0
Carbohydrate (g)	0.0	4.6
Caloric sweetener (g)	0.0	4.6
Cholesterol (mg)	4	0
Sodium (mg)	17 <sup>3</sup>	2

<sup>1</sup>The fat and sweetener composites did not contain significant amounts of vitamins and minerals considered in the development of this food guidance system with one exception: 60 IU of vitamin A in 1 tsp of the added fat composite.

<sup>2</sup>The proportion of meat fat in the added fat composite is less than its proportion in the food supply to account for the fat present in the lean meat composite used in the examples.

<sup>3</sup>The sodium in the added fat composite is from salted butter and margarine.

Table 11.--Example A<sup>1</sup>: Levels of food energy and selected food constituents as increasing amounts of fat and sweeteners are added

Food constituent											
		-----Percent of calories-----									
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<sup>1</sup>Example A (see table 3) before including any added fat or sweetener contains 1240 kcal, 79 g protein, 25 g fat, 267 mg cholesterol, 179 g carbohydrate, 2 g sweeteners, and 1240 mg sodium.

<sup>2</sup>See table 10 for composition per teaspoon.



Table 12.--Example B<sup>1</sup>: Levels of food energy and selected food constituents as increasing amounts of fat and sweeteners are added

Food constituent															
Added fat <sup>2</sup>		Added sweet- eners <sup>2</sup>	Food energy	Protein	Fat	Satu- rated fatty acids	Mono- unsat- urated fatty acids	Poly- unsat- urated fatty acids	Carbo- hydrate	Sweet- eners	Choles- terol	Sodium			
tsp	tsp		kcal	-----Percent of calories-----										mg	mg
5	0		1710	22	27	9	10	5	52	1	315	1620			
5	6		1810	21	26	8	10	5	55	7	315	1630			
8	9		1980	19	29	10	11	6	53	9	325	1680			
10	11		2090	18	31	10	11	7	52	10	330	1720			
12	13		2200	17	33	11	12	7	51	11	340	1760			
14	14		2290	16	35	12	12	8	50	12	345	1790			

<sup>1</sup>Example B (see table 3) before including any added fat or sweetener contains 1520 kcal, 94 g protein, 31 g fat, 295 mg cholesterol, 221 g carbohydrate, 2 g sweeteners, and 1540 mg sodium.

<sup>2</sup>See table 10 for composition per teaspoon.

Table 13.--Example C<sup>1</sup>: Levels of food energy and selected food constituents as increasing amounts of fat and sweeteners are added

Food constituent											
Added fat <sup>2</sup>	Added sweet- eners <sup>2</sup>	Food energy	Protein	Fat	Saturated fatty acids	Mono-unsaturated fatty acids	Poly-unsaturated fatty acids	Carbo- hydrate	Sweet- eners	Choles- terol	Sodium
-----Percent of calories-----											
<u>tsp</u>	<u>tsp</u>	<u>kcal</u>									
6	0	1960	21	28	9	10	5	52	1	340	1790
6	7	2080	20	26	8	10	5	55	7	340	1800
8	9	2200	19	28	9	10	6	54	8	350	1830
11	13	2380	18	31	10	11	7	53	11	360	1890
13	15	2490	17	32	11	12	7	52	12	370	1930
15	17	2600	16	34	11	12	8	51	13	375	1960

<sup>1</sup>Example C (see table 3) before including any added fat or sweetener contains 1740 kcal, 105 g protein, 35 g fat, 320 mg cholesterol, 255 g carbohydrate, 3 g sweeteners, and 1690 mg sodium.

<sup>2</sup>See table 10 for composition per teaspoon.

Table 14.--Example D<sup>1</sup>: Levels of food energy and selected food constituents as increasing amounts of fat and sweeteners are added

Food constituent												
Added fat <sup>2</sup>	Added sweet- eners <sup>2</sup>	Food energy	Protein	Fat	Satu- rated fatty acids	Mono- unsat- urated fatty acids	Poly- unsat- urated fatty acids	Carbo- hydrate	Sweet- eners	Choles- terol	Sodium	
<u>tsp</u>	<u>tsp</u>	<u>kcal</u>	-----Percent of calories-----								<u>mg</u>	<u>mg</u>
8	0	2320	19	28	9	10	6	54	1	350	2090	
8	10	2500	18	26	8	9	5	58	8	350	2120	
10	12	2610	17	28	9	10	6	57	9	355	2140	
13	15	2780	16	30	10	11	6	55	10	370	2190	
17	19	3000	15	33	11	12	7	54	12	385	2260	
20	22	3160	14	35	11	12	8	53	13	395	2320	

<sup>1</sup>Example D (see table 3) before including any added fat or sweetener contains 2025 kcal, 113 g protein, 38 g fat, 320 mg cholesterol, 314 g carbohydrate, 3 g sweeteners, and 1950 mg sodium.

<sup>2</sup>See table 10 for composition per teaspoon.



Table 15.--Example A2<sup>1</sup>: Levels of food energy and selected food constituents as increasing amounts of fat and sweeteners are added

Food constituent											
Added fat <sup>2</sup>	Added sweet- eners <sup>2</sup>	Food energy	Protein	Fat	Satu- rated fatty acids	Mono- unsat- urated fatty acids	Poly- unsat- urated fatty acids	Carbo- hydrate	Sweet- eners	Choles- terol	Sodium
-----Percent of calories-----											
<u>tsp</u>	<u>tsp</u>	<u>kcal</u>								<u>mg</u>	<u>mg</u>
3	0	1000	23	27	9	10	5	51	( <sup>3</sup> )	195	960
4	4	1110	21	27	9	10	6	53	7	200	980
6	6	1220	19	31	10	11	7	51	10	205	1020
8	8	1330	17	34	11	12	8	50	12	215	1060
9	9	1380	17	35	12	12	8	49	12	215	1080

<sup>1</sup>Example A2 (see table 3, footnote 2) before including any added fat or sweetener contains 890 kcal, 58 g protein, 17 g fat, 183 mg cholesterol, 127 g carbohydrate, 1 g sweeteners, and 910 mg sodium.

<sup>2</sup>See table 10 for composition per teaspoon.

<sup>3</sup>0.5 percent or less.

Table 16.--Energy and nutrient information for selected "trade-offs"<sup>1</sup>

Food item and amount	Food energy kcal	Protein g	Fat g	Carbo- hydrate g	Calcium mg	Iron mg	Mag- nes- ium mg	Phos- phor- us mg	Zinc mg	Vita- min A value IU	Thi- a- min mg	Ribo- vin mg	Pre- formed niacin mg	Vita- min B <sub>6</sub> mg	Vita- min B <sub>12</sub> µg	Ascor- bic acid mg	Fol- a- cin µg	Sodium mg	Potas- sium mg
1. Skim milk (1 cup)	86	8.4	0.4	11.9	302	0.1	28	247	0.98	500	0.09	0.34	0.2	0.10	0.93	2	13	126	406
Trade-off fat (2 tsp) <sup>2</sup>	76	--	8.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL	162	8.4	9.0	11.9	302	0.1	28	247	0.98	500	0.09	0.34	0.2	0.10	0.93	2	13	126	406
Whole milk (1 cup)	149	8.1	8.1	11.5	290	0.1	32	227	0.93	307	0.10	0.39	0.2	0.10	0.88	2	12	120	371
2. Bread, white enriched (1 slice)	75	2.3	1.1	13.7	35	0.8	6	30	0.17	0	0.13	0.09	1.1	0.01	0.00	0	9	144	31
Sugar (6 tsp) <sup>3</sup>	92	--	--	23.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trade-off fat (3 tsp)	114	--	12.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL	281	2.3	13.9	37.6	35	0.8	6	30	0.17	0	0.13	0.09	1.1	0.01	0.00	0	9	144	31
White layer cake with icing (1/16 cake)	271	3.0	11.0	41.7	56	0.7	13	53	0.26	21	0.07	0.11	0.7	0.02	0.06	0	4	200	77
3. Sugar (12 tsp) <sup>3</sup>	185	--	--	47.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fruit-flavored punch (12 oz)	195	0.0	0.0	49.5	11	0.4	8	0	0.19	( <sup>4</sup> )	0.07	0.11	0.0	0.07	0.00	( <sup>4</sup> )	0	53	71
4. Meat, fish, poultry composite (1 oz) <sup>5</sup>	60	8.0	2.9	0.1	4	0.6	7	64	1.13	256	0.04	0.08	1.8	0.10	0.95	0	3	38	97
Trade-off fat (3 tsp)	114	--	12.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL	174	8.0	15.7	0.1	4	0.6	7	64	1.13	256	0.04	0.08	1.8	0.10	0.95	0	3	38	97
Peanut butter (2 tbsp)	188	8.1	16.2	6.0	19	0.5	55	122	0.93	0	0.04	0.04	4.7	0.11	0.00	0	25	162	201

<sup>1</sup>Trade-offs are foods or groups of foods that are about equal in calorie, protein, total fat, and total carbohydrate content. Vitamins and minerals were also considered in the development of the trade-offs. Nutrient values for the food items are from USDA data. Values for a particular brand or type of product may be different from those shown. Only total fat or total carbohydrate and calories are listed for trade-off fat and sugar because their protein, vitamin, and mineral contribution is minimal.

<sup>2</sup>Trade-off fat is a weighted composite of fats based on 1981 National Food Supply data for fats and oils (58).

<sup>3</sup>Granulated beet and cane sugar.

<sup>4</sup>Some fruit drinks, ades, or punches are fortified with vitamin C and possibly vitamin A and thus would contribute significant amounts of these nutrients.

<sup>5</sup>Nutrient composition for the meat, fish, poultry composite was calculated as described on page 27.

Table 17.--Energy and nutrient content of foods in 10 menus<sup>1</sup>

Nutrient	Menu										All Menus	
	1	2	3	4	5	6	7	8	9	10	Mean	Maximum
Food energy (kcal)	1990	1940	1930	2000	1980	2110	2110	1990	2070	1850	2000	2110
Protein (% kcal)	21	19	20	19	19	19	20	21	17	17	19	21
Total fat (% kcal)	29	31	34	34	34	33	29	28	25	28	30	34
Total carbohydrate (% kcal)	49	52	43	49	48	51	52	52	60	57	51	60
Added caloric sweeteners (% kcal)	5	5	5	11	13	12	5	11	8	8	8	13
Alcohol (% kcal)	4	0	4	0	0	0	0	0	0	0	( <sup>6</sup> )	( <sup>6</sup> )
Protein (% of RDA)	234	205	224	214	211	225	238	233	201	177	216	238
Calcium (% of RDA)	127	128	125	159	138	145	114	140	121	142	134	159
Iron (% of RDA)	88	83	87	66	70	75	103	102	83	63	82	103
Magnesium (% of RDA)	137	113	96	106	84	129	108	118	146	120	116	146
Phosphorus (% of RDA)	206	187	180	192	182	197	194	177	188	180	188	206
Zinc (% of RDA)	109	78	92	60	88	67	115	120	92	69	89	120
Vitamin A (% of RDA)	190	189	234	542	115	136	334	291	173	205	241	542
Thiamin (% of RDA)	168	133	148	213	154	132	238	133	154	189	166	238
Riboflavin (% of RDA)	177	176	155	179	148	176	178	146	170	151	166	179
Preformed niacin (% of RDA) <sup>2</sup>	171	211	175	192	139	233	175	151	169	146	176	233
Vitamin B <sub>6</sub> (% of RDA) <sup>3</sup>	122	105	80	95	77	117	82	81	120	95	97	122
Vitamin B <sub>12</sub> (% of RDA)	140	115	140	161	150	154	138	144	124	105	137	161
Ascorbic acid (% of RDA)	376	150	134	283	232	383	175	201	97	274	231	383
Folacin (% of RDA)	99	74	57	77	70	80	103	75	62	84	78	103
Cholesterol (mg)	185	205	490	340	400	330	390	215	380	410	335	490
Sodium (mg) <sup>4</sup>	2080	1480	2610	2260	2450	1740	1730	2480	1920	2560	2130	2610
Potassium (mg) <sup>5</sup>	3970	3320	2140	2860	2470	4090	3040	2470	2780	2570	2970	4090

<sup>1</sup>Menus 1 through 10 are in Appendix II. They correspond approximately to Example B and provide around 2,000 kcal + 150 kcal.

<sup>2</sup>Only preformed niacin and not niacin from tryptophan was included in the nutrient analysis; thus the values for the percent of RDA for niacin are lower than what is actually provided in the menus.

<sup>3</sup>Calculations are based on value in RDA table.

<sup>4</sup>The Committee on Dietary Allowances recommends a "safe and adequate" range of 1,100 to 3,300 mg of sodium for adults. All 10 menus provide levels of sodium within this range.

<sup>5</sup>The Committee on Dietary Allowances recommends a "safe and adequate" range of 1,875 to 5,625 mg of potassium for adults. All 10 menus provide levels of potassium within this range.

<sup>6</sup>Calculation was not appropriate.



Table 18.--Menu 1 adapted for individuals differing by sex and age  
[Dash indicates none served]

Meal and menu item	Child 4 yr	Male 16 yr	Female 30 yr	Male 40 yr	Female 60 yr
-----Amount-----					
<u>BREAKFAST</u>					
Orange juice	3/4 cup	3/4 cup	3/4 cup	3/4 cup	3/4 cup
Oatmeal with	1/2 cup	1 cup	1 cup	1 cup	1/2 cup
Sugar	1 tsp	2 tsp	2 tsp	2 tsp	1 tsp
Raisins	1 tbsp	2 tbsp	-	-	-
Milk (1% low-fat)	1/2 cup	1 cup	1 cup	1 cup	1 cup
<u>LUNCH</u>					
Chicken sandwich:					
Sliced chicken	1-1/2 oz	3 oz	2 oz	3 oz	2 oz
Lettuce	1/2 leaf	1 leaf	1 leaf	1 leaf	1 leaf
Mayonnaise-type dressing	2 tsp	3 tsp	2 tsp	3 tsp	2 tsp
Whole-wheat bread	1 slice	2 slices	2 slices	2 slices	2 slices
Bean salad	1/3 cup	3/4 cup	3/4 cup	3/4 cup	1/2 cup
Milk (1% low-fat)	1/2 cup	1 cup	-	-	-
Chocolate chip cookie	-	2 avg	2 avg	2 avg	1 avg
Banana	1/2 med	1 med	1 med	1 med	1 med
<u>DINNER</u>					
Roast beef (round, lean only)	2 oz	3 oz	4 oz	4 oz	3 oz
Rice (enriched)	1/3 cup	1 cup	1/2 cup	1 cup	1/2 cup
Broccoli	1/3 cup	3/4 cup	3/4 cup	3/4 cup	1/2 cup
Sliced tomato salad:					
Tomato, fresh	2/3 med	1 med	1 med	1 med	1 med
Lettuce	1 leaf	1 leaf	1 leaf	1 leaf	1 leaf
Italian salad dressing	1 tbsp	2 tbsp	1 tbsp	2 tbsp	1 tbsp
Margarine	1 tsp	2 tsp	1 tsp	2 tsp	1 tsp
<u>SNACKS</u> <sup>1</sup>					
Milk (1% low-fat)	1 cup	1 cup	1 cup	1 cup	1 cup
Chocolate chip cookie	1	-	-	-	-
Apple (fresh)	-	1 avg	-	1 avg	-
Peanut butter sandwich:					
Peanut butter	1 tbsp	2 tbsp	-	-	-
Jelly	1 tsp	2 tsp	-	-	-
White bread, enriched	1 slice	2 slices	-	-	-
Fruit punch	6 oz	12 oz	-	-	-
Carrot sticks	-	1 med	-	-	-
White wine <sup>2</sup>	-	-	4 oz	4 oz	-
English muffin (enriched)	-	1 whole	1 whole	1 whole	1 whole
Margarine	-	2 tsp	2 tsp	2 tsp	1 tsp

<sup>1</sup>Snack items are distributed throughout the day.

<sup>2</sup>The inclusion of an alcoholic beverage in the menu does not mean its use is advocated. It simply illustrates that it can fit in a balanced diet if an individual chooses to drink alcohol.

Table 19.—Energy and nutrient content of foods in menu 1 adapted for individuals differing by sex and age<sup>1</sup>

Nutrient or food constituent	Child, 4 yr			Male, 16 yr			Female, 30 yr			Male, 40 yr			Female, 60 yr		
	Amount in unit of measure	% of kcal	% of RDA	Amount in unit of measure	% of kcal	% of RDA	Amount in unit of measure	% of kcal	% of RDA	Amount in unit of measure	% of kcal	% of RDA	Amount in unit of measure	% of kcal	% of RDA
Food energy (kcal)	1400	—	—	2940	—	—	1990	—	—	2340	—	—	1570	—	—
Protein (g)	68	20	228	126	17	225	103	21	234	113	19	202	86	22	196
Fat (g)	47	30	—	98	30	—	63	29	—	79	30	—	50	28	—
Carbohydrate (g)	184	53	—	405	55	—	241	49	—	287	49	—	202	51	—
Caloric sweeteners (g)	40	11	—	80	11	—	26	5	—	29	5	—	13	3	—
Alcohol (g)	0	—	—	0	—	—	11	4	—	11	3	—	0	0	—
Calcium (mg)	815	—	102	1455	—	121	1015	—	127	1040	—	130	935	—	117
Iron (mg)	8.7	—	87	19.2	—	107	15.8	—	88	17.8	—	178	12.0	—	120
Magnesium (mg)	285	—	142	545	—	136	410	—	137	430	—	123	330	—	111
Phosphorus (mg)	1160	—	145	2100	—	175	1650	—	206	1740	—	217	1380	—	173
Zinc (mg)	9.9	—	99	18.2	—	121	16.3	—	109	17.3	—	115	12.9	—	86
Vitamin A value (IU)	4270	—	171	15110	—	302	7600	—	190	7860	—	157	5860	—	147
Thiamin (mg)	1.1	—	122	2.3	—	166	1.7	—	168	1.8	—	131	1.4	—	144
Riboflavin (mg)	1.6	—	159	2.9	—	171	2.1	—	176	2.2	—	138	1.9	—	158
Preformed niacin (mg) <sup>2</sup>	15	—	138	32	—	176	22	—	171	29	—	160	20	—	150
Vitamin B <sub>6</sub> (mg)	1.5	—	118	3.0	—	151	2.4	—	122	2.6	—	120	2.2	—	108
% of 0.02 x g protein	—	—	113	—	—	120	—	—	118	—	—	117	—	—	125
Vitamin B <sub>12</sub> (μg)	3.1	—	122	4.7	—	155	4.2	—	140	4.3	—	144	3.7	—	122
Ascorbic acid (mg)	215	—	478	370	—	617	225	—	377	235	—	390	190	—	317
Folacin (μg)	270	—	134	485	—	121	395	—	99	400	—	100	345	—	86
Cholesterol (mg)	115	—	—	195	—	—	185	—	—	210	—	—	155	—	—
Sodium (mg)	1270	—	—	2910	—	—	2080	—	—	2310	—	—	1780	—	—
Potassium (mg)	2630	—	—	5110	—	—	3970	—	—	4230	—	—	3420	—	—

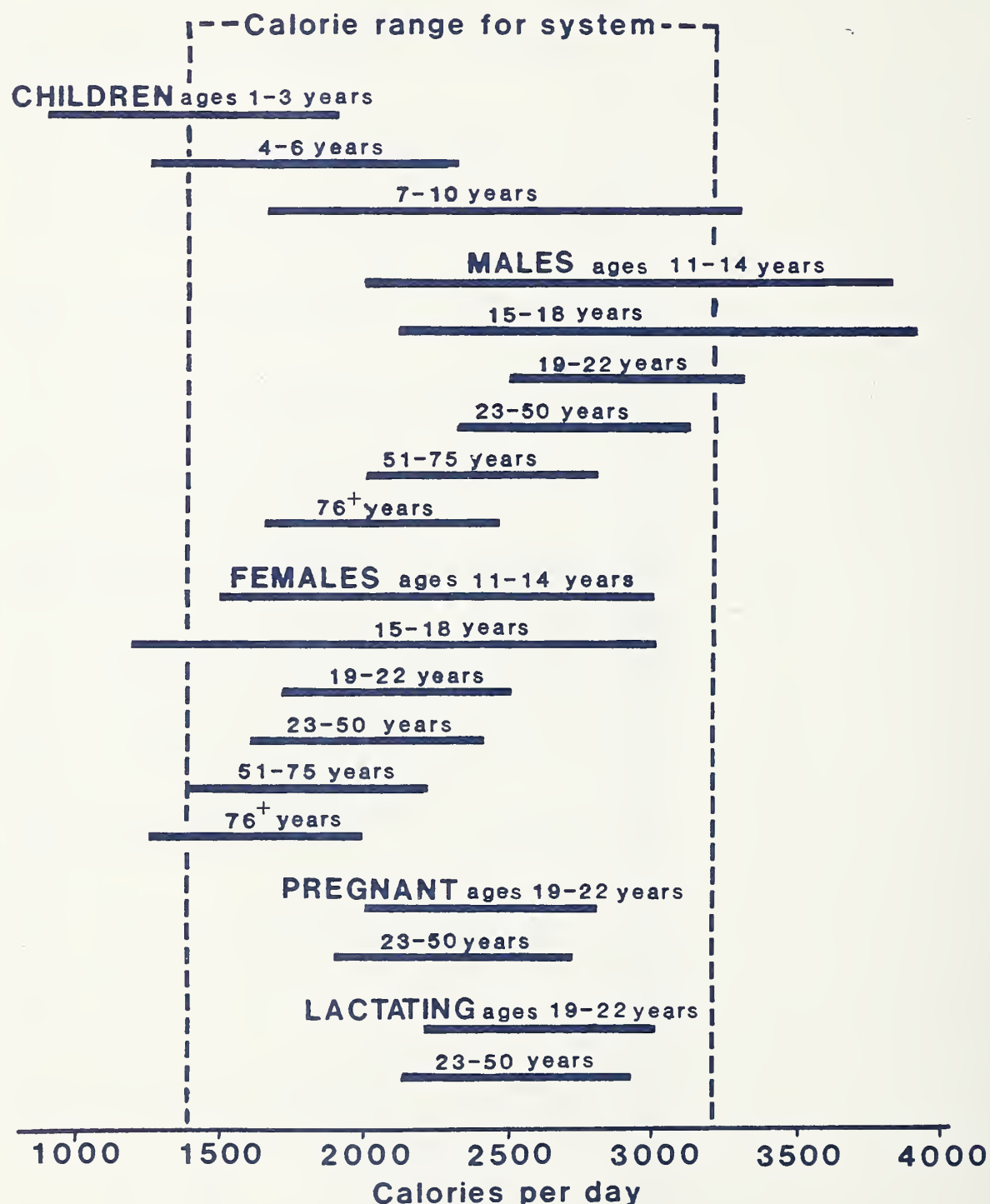
<sup>1</sup> Adaptations of Menu 1 approximate Example A2 (4-year old child), Example D (16-year old male), Example B (30-year old female), Example C (40-year old male), and Example A (60-year old female). Other combinations could have been developed.

<sup>2</sup> Only preformed niacin and not niacin from tryptophan was included in the nutrient analysis; thus, the values for the percent of RDA for niacin are lower than what is actually provided by these menus.

## FIGURES

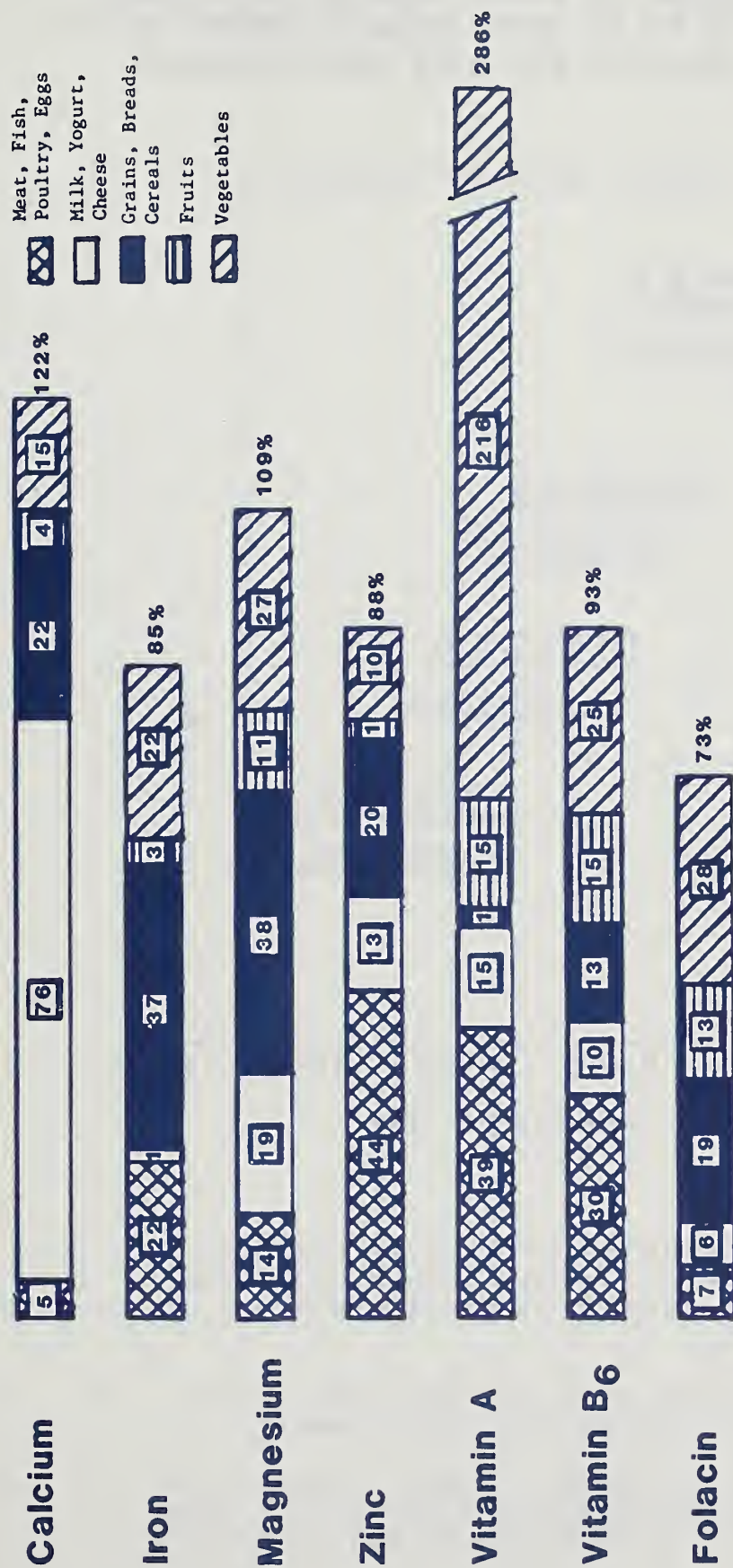


**Figure 1. Recommended ranges of food energy intake for various sex-age groups<sup>1</sup> and range for food guidance system**

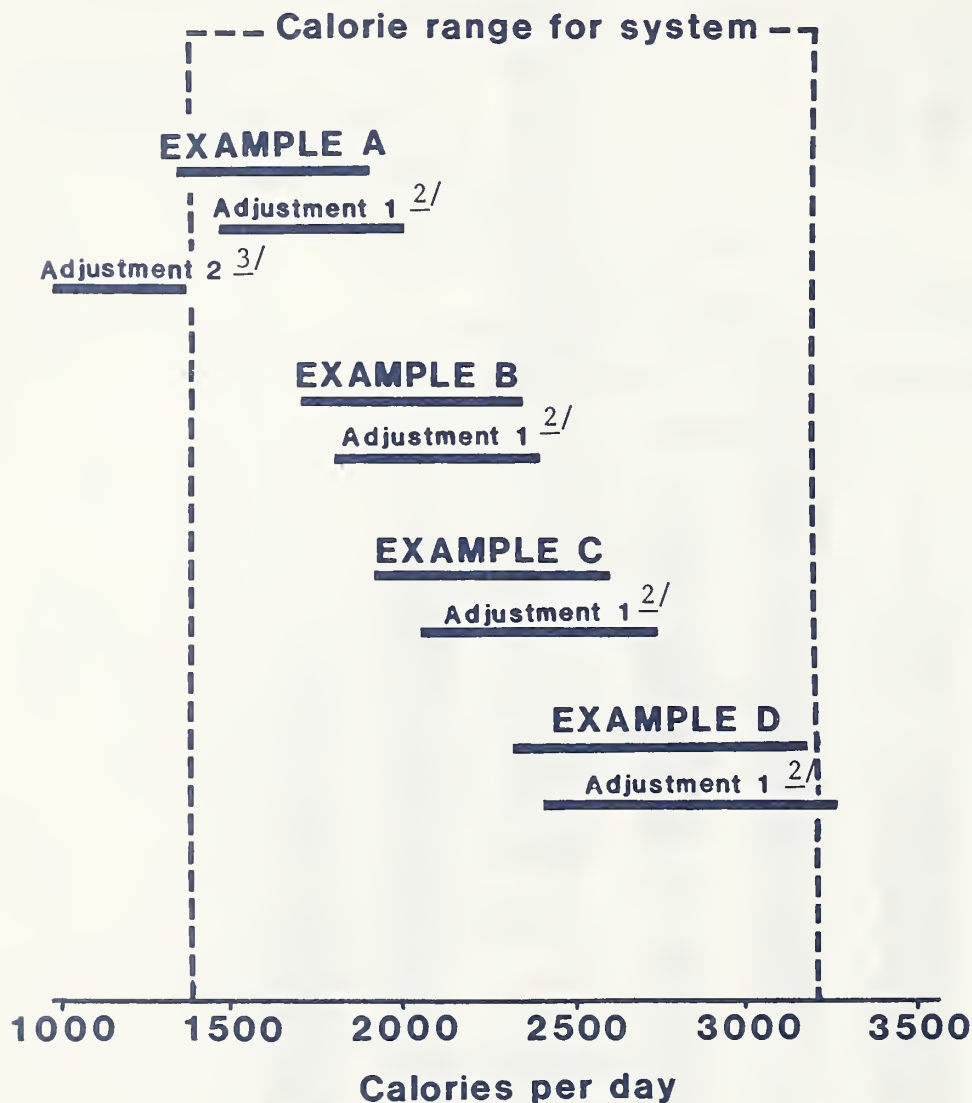


<sup>1</sup>Committee on Dietary Allowances, Food and Nutrition Board, National Academy of Sciences, Recommended Dietary Allowances, 9th Edition, 1980, p. 23.

**Figure 2. Example B. Contribution to problem nutrients by food groups, as a percentage of RDA for females, ages 23-50 years**



**Figure 3. Ranges of food energy provided by Examples A to D (and adjustments) with varying additions of fat and sweeteners<sup>1</sup>**

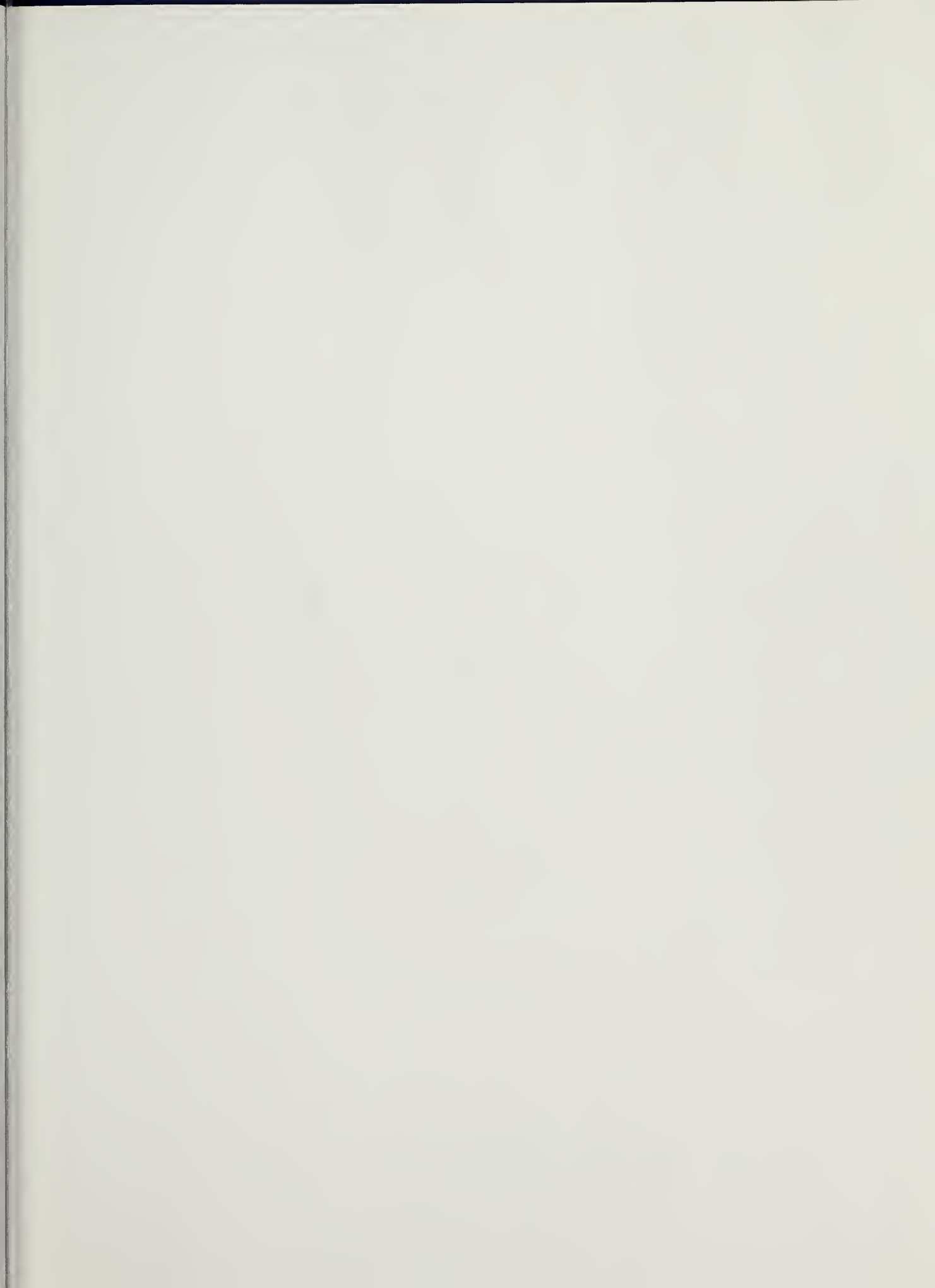


<sup>1</sup>Varying additions of fat and sweeteners are illustrated in Tables 12-16. Percentage of calories from fat varies from 25 to 35 percent; percentage of calories from sweeteners varies from 1 to 13 percent.

<sup>2</sup>Includes an additional cup of skim milk to meet calcium needs of teenagers and pregnant and lactating women.

<sup>3</sup>Includes 2/3 of serving sizes of Example A except for the milk, yogurt, cheese group--serving size remains at 1 cup of skim milk; adjustment 2 is appropriate for many young children.

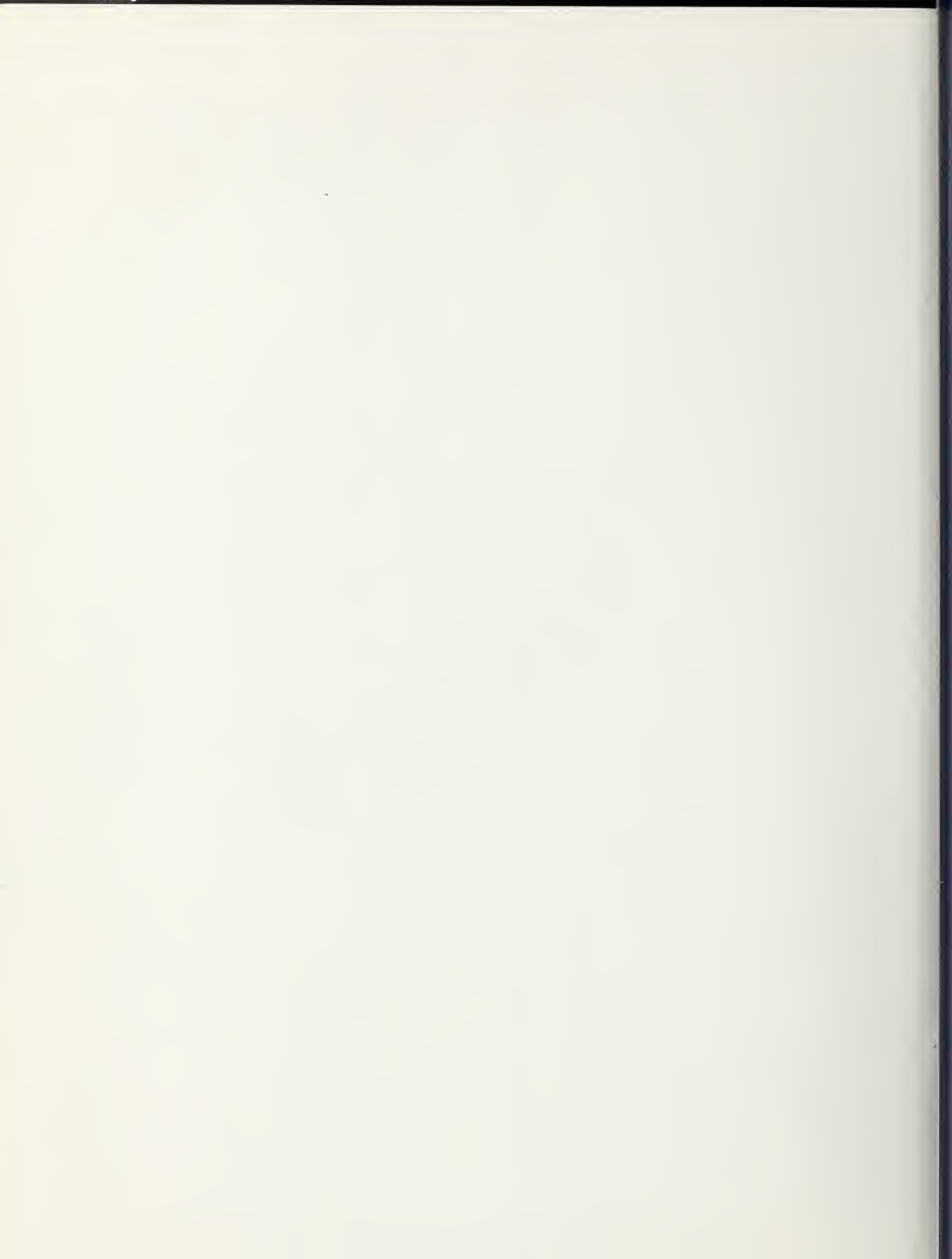


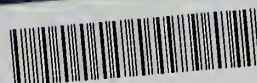












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